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Volume 53 - Issue 1 - February, 1943

Rose Technic Staff
Rose-Hulman Institute of Technology

ROSE TECHNIC

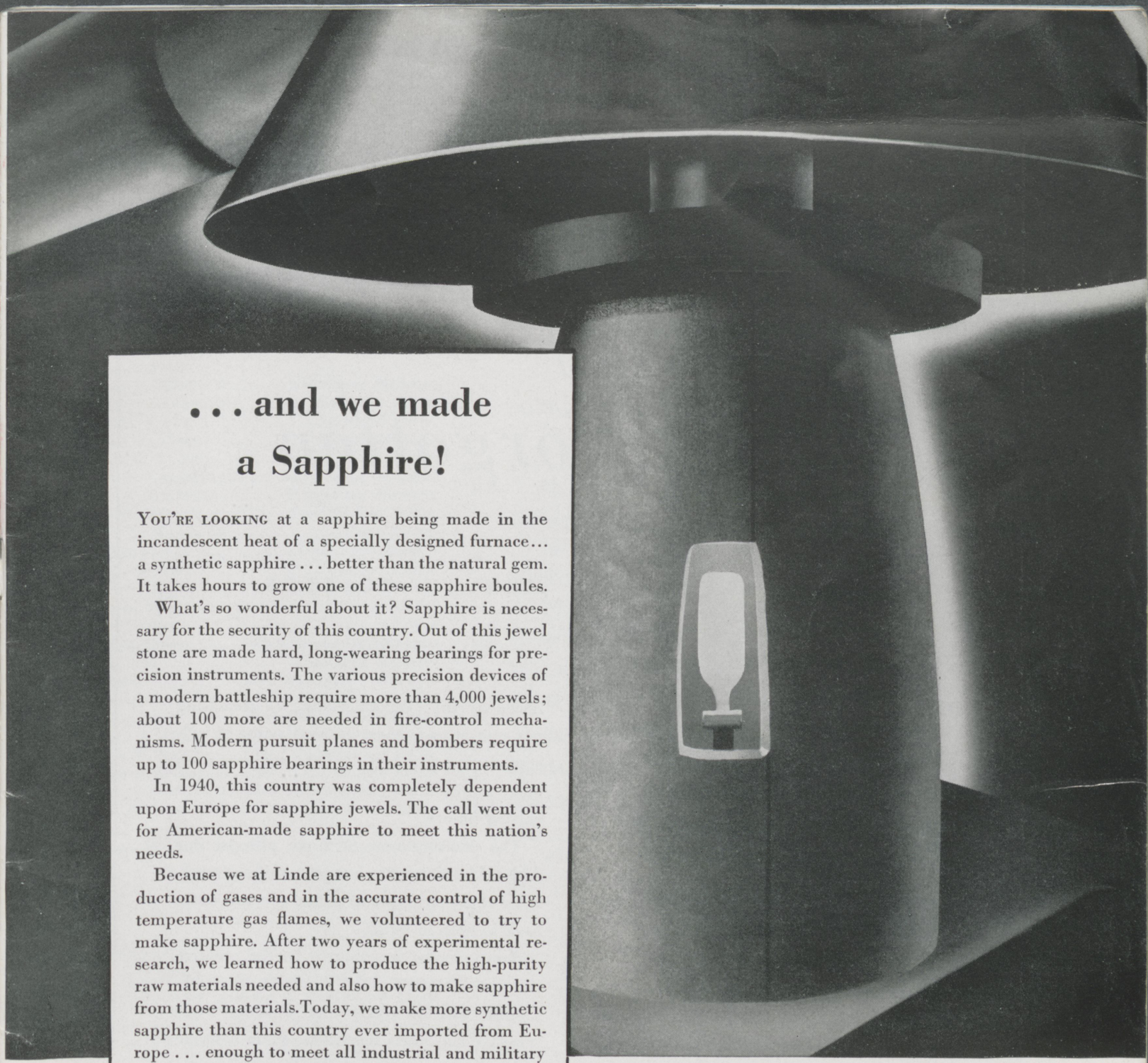
FEBRUARY 1943

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Rose plans to cooperate with the government in any way possible in the new Specialized College Training Programs. At the same time, it is expected that regular schedules will be maintained for students now in college and the group entering in February. For information about programs, write the Registrar.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA



. . . and we made a Sapphire!

YOU'RE LOOKING at a sapphire being made in the incandescent heat of a specially designed furnace... a synthetic sapphire . . . better than the natural gem. It takes hours to grow one of these sapphire boules.

What's so wonderful about it? Sapphire is necessary for the security of this country. Out of this jewel stone are made hard, long-wearing bearings for precision instruments. The various precision devices of a modern battleship require more than 4,000 jewels; about 100 more are needed in fire-control mechanisms. Modern pursuit planes and bombers require up to 100 sapphire bearings in their instruments.

In 1940, this country was completely dependent upon Europe for sapphire jewels. The call went out for American-made sapphire to meet this nation's needs.

Because we at Linde are experienced in the production of gases and in the accurate control of high temperature gas flames, we volunteered to try to make sapphire. After two years of experimental research, we learned how to produce the high-purity raw materials needed and also how to make sapphire from those materials. Today, we make more synthetic sapphire than this country ever imported from Europe . . . enough to meet all industrial and military needs. Thus America need never again be dependent upon an outside source.

Right now, we make colorless sapphire because colorless jewels make harder bearings. No sapphire is available for anything but war production. In the future we stand ready to make ruby and other gem stone materials for the jewelry trade . . . and for you.

This research development by The Linde Air Products Company is paralleled by other recent achievements of Electro Metallurgical Company, Carbide and Carbon Chemicals Corporation, and National Carbon Company, Inc.—all of which are Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
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HIS BEARINGS ARE RIGHT—Chronometers, compasses, and other navigational aids must be rugged as well as precise. Sapphire bearings can "take it."

FLYING JEWELS—Pilots' lives and the success of their missions depend upon accurate instruments. Sapphire bearings assure continued accuracy.

LABORATORY WARRIORS—Delicate balances, time instruments, and other important precision equipment of the research worker need sapphire jewels, too.

YOURS IN THE FUTURE—Flawless gems...such as rubies, sapphires, and spinel . . . made by this same Linde process . . . will be available for jewelry in the future.

BUY UNITED STATES WAR BONDS AND STAMPS

Your future is not forgotten

★ A MESSAGE TO MEN IN COLLEGE

There will be a future.

The very service you are being called upon to render to your country is assurance of that. We know the stuff you're made of, because we have watched two generations of college men join our ranks and grow with us.

And the materiel which we older men in industry are pouring out makes assurance doubly sure.

What kind of future will you have?

By chapter and verse, no one can recite *exactly*. But a lot of folks like us mean to see that Opportunity is going to be greater than any generation of young men has ever known.

Every hour of thinking time we can catch on the fly is devoted to that one aim. Here at Alcoa we call it Imagineering. We are letting our imagination soar, and ballasting it with engineering experience. Our purpose is to make aluminum make jobs where none ever existed before.

The exciting new uses we glimpse for Alcoa Aluminum are our part of the groundwork of the structure of peace you will come back to help to build.

Your chance is going to be the creative chance. The materials, the tools, the techniques, will be ready and waiting. Your imagination, your ingenuity, your courage to do, cannot, must not, fail to have their turn.

As man to man we say it, soberly: Your future is not forgotten.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

ROSE TECHNIC

VOLUME LIII FEBRUARY, 1943 NUMBER 1

STAFF

FRONTISPAGE

Marine reduction gears are cut with the greatest precision in an air conditioned room at the Steam Division of the Westinghouse Electric and Manufacturing Company. Once the tooth-cutting operation is started, it must be continued without stopping for about seven days at constant temperature to insure the utmost accuracy. The slightest discrepency would cause a deafing screeching and squealing when these gears turn at high speeds.

COVER

With this issue, the Rose Technic starts its fifty-third year of publication and in keeping with tradition, the cover design has been changed. Credit is due to William E. Tingley, Art Editor, for designing the striking cover. This design will be used on each of the nine following issues with only a variation of color scheme. We feel certain that this new year of publication will be as successful as each of the preceding fifty-two.

The cover picture of this month's issue of the Technic shows the pouring of a large mold at the Terre Haute Malleable and Manufacturing Company. A large overhead crane supports the ladle and allows the men to pour the molten metal in the molds.

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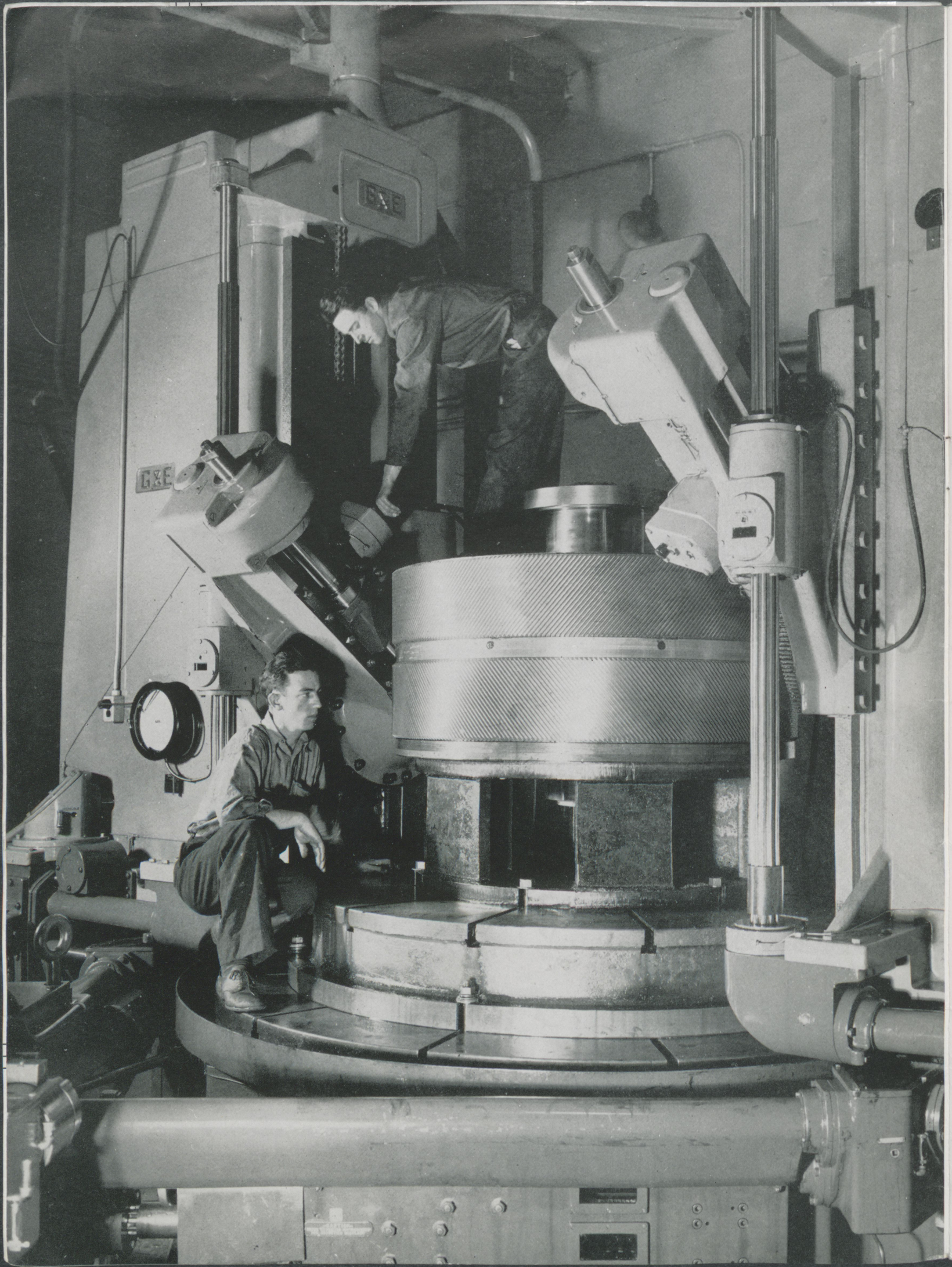

G&E
G&E

DOING OUR BIT

Much has been said about the attitude of those fortunate enough to remain in school during our nation's present crisis. The bitter part of these discussions is the revelation that some of the students are wasting time, valuable time, in which they should be gathering all the knowledge and training possible. The old adage that where there is smoke there is fire certainly applies in this instance, for the accusations of student indolence and lack of initiative are made by those who gain only in judging justly. Theirs is the evidence of lapse in studying and general attitude of the student body with which they back their statements.

What is the student answer to these charges? The defense is very weak because the most of the accused are guilty; yet not all the blame can be placed upon the shoulders of the offenders. Since the usual red-tape and politics accompany military affairs connected with civilian life, the students know not what may happen tomorrow and can not believe the timely dispatches that are issued concerning their status. This condition collaborating with human nature result in a unstabliness which give many a devil-may-care attitude toward not only their studies but their whole life in general. More emphasis is placed upon scholastic work because in a sense it is their duty in these times to give their best.

The seat of trouble is the failure of the students to analyse and decide upon the correct conduct in the situation. Most of the number are willing to tread in the paths of the weak that of abiding time until they are called to serve in the armed forces. The general opinion is that school is unimportant since all are going to the army before they are able to graduate. This line of thought is paralleled by the romantic conception of each individual that he will give his life for his country on a field of battle. This distorted thinking serves as an excuse of evading unpleasant tasks and following the easy road.

To those who believe as the aforementioned may this be said. The chief anxiety of the students should be what they are to do if they are allowed to remain in school or called to serve in a civilian capacity, for then their concern is one of preparedness. Those who never reach the distant battle front or those who return should worry about being able to rebuild the ruins. Students who have continued to work have no problem for they are prepared to meet any situation arising. The army will give success to the industrious, and to the prepared who remain on the home front will come the satisfaction of being able to do the job well. What is to be the lot of one who is not called to the service and not prepared to stay?

Let us, the students, accept the challenge. God did not fashion us as lilies but as men; then let us show the stuff from which we are made.

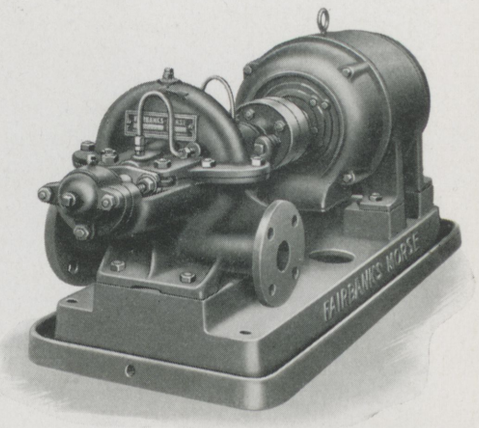
by Kenneth Allison, senior, c.e.

EVOLUTION

By JOHN R. WHITE,
soph., m.e.

Modern pumps are playing an important part in the war plants of America today. The problem of the transportation of liquids and gases has long been of prime importance in modern industry.

In this article, Mr. White describes the evolution of the first crude pump up to the present centrifugal and suction pumps.



Courtesy Fairbanks-Morse

Modern Split-Casing Centrifugal Pump

THE raising of water from one level to another by mechanical means goes back so far that it would be virtually impossible to determine when the first machine, classified as a pump, came into existence. Egyptian records show conclusively the use of such a labor saving device as early as 1500 B. C. From these very remote ages man has developed the pump step by step until the modern centrifugal and turbine pumps have been produced.

Since the pump was originated in the Orient, it naturally was developed to a more profitable extent in that section of the world sooner than in other portions. All the Oriental countries used pumps for domestic purposes and for the irrigation of land. Soon after the Egyptians made their pioneer discoveries, the people of India experimented with this idea and developed the oscillating wooden trough, resembling very much the present day "Old Mill Wheel." The next advancement was the addition of windlass and bucket arrangements inaugurated by the Chinese.

Another type of contrivance called the Noria was found in Palestine, China, and Egypt. The Noria was simply a water wheel with bucket attachments. This wheel was turned by the current of the stream, and when the buckets reached a certain height they were emptied in a spillway, after which the water continued to a canal or reservoir.

The Doon, another early type of pump, consisted of a basket attached to two ropes. Two men swung the ropes into a stream to fill the basket, and on the return swing the water was discharged by a dextrous twist. 20,000 cubic feet of water could be raised one foot in ten hours time by this method.

The next great step in the pump's development was taken by Vitruvius, a Roman engineer of the early Christian Era. This brilliant man designed many rotary pumping units involving the use of chains and buckets. So advanced were his designs that no basic changes were made until the eighteenth century.

Water raising machines using the principles of the screw are said to have been first perfected by Archimedes the Greek mathematician. The Romans eventually followed the plans of Archimedes and constructed screws of planked grooves in a spiral arrangement around a solid cylinder. This contrivance was placed within a hollow cylinder of the same length and revolved. Thus, the design of the present day pump was born.

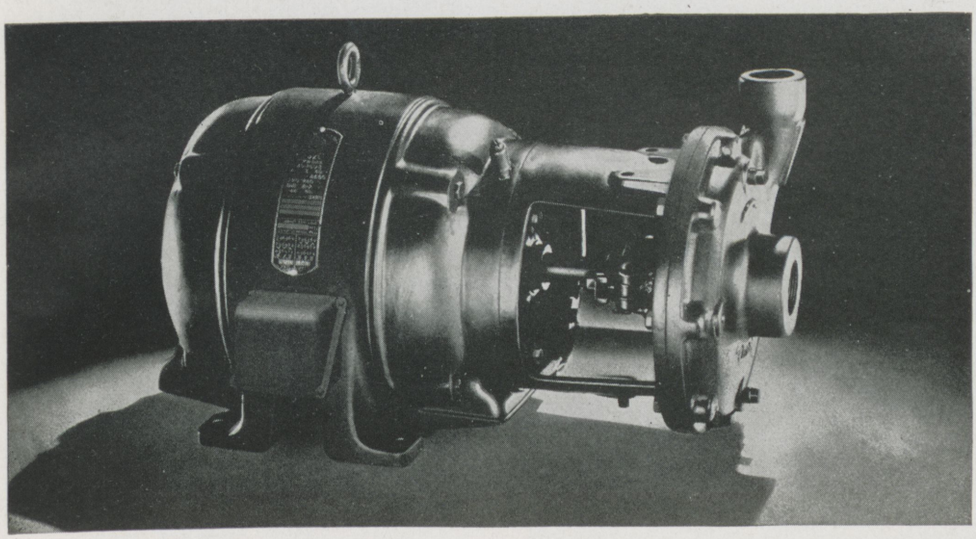
The modern chain pump, which consists of a tube through which the water is raised by a series of pistons, is an outgrowth of the early pump of Ctesibus. His apparatus consisted of only two pistons in a closed tube. The water was raised by the upstroke and lowered by the downstroke. There was no consideration for the use of atmospheric pressure in connection with this type of pump until the year 1643, when Torricelli discovered that water could be raised by means of air pressure. Galileo failed to answer an ancient pump maker's question as to why water enclosed in a tube under no pressure would not rise above 33 feet. After the death of Galileo, Torricelli experimented with this fact and established the law that the heights attained by liquids in a closed tube under atmospheric pressure were proportional to their specific gravities.

The use of steam pressure was first developed by Giovanni Baptista della Porta. His plan called for the generation of steam in a boiler. The steam was then passed off to a water filled vessel where it forced the water through a pipe. Jerome Cardan, an Italian, published similar descriptions for the use of steam pumps.

Sir Samuel Moreland, in the year 1675, invented a plunger type pump. A rod with an enlarged end was placed in a chamber, thus forcing the water out. The bucket pump was another step to our modern pumps. The water in this pump would pass through the valves in a piston on the down-stroke. These valves would close on the up-stroke and the water was lifted to any desired point.

Just prior to 1700 Thomas Savery introduced a pump for emptying the water from mines in Cornwall, England. This pump used successfully the principles of steam, and from it grew the Cornish engine. The Cornish engine was designed expressively for the purpose of raising water from deep mines, a job which it accomplished successfully. The method of operating this apparatus calls for the steam in a cylinder to lift a weighted plunger to the upper limit of its stroke, after which it settles down and forces up a volume of water equal to the weight of the plunger. The Cornish pump was ideal under slow working conditions and where it was not called upon to lift water to any great height, but under adverse conditions it was not capable of meeting the requirements. The rotative engine was the solution to the problem of raising water great

OF PUMPS



Courtesy Fairbanks-Morse

Centrifugal Pump, 1913 Model.

heights. This contrivance used revolving pistons involving steam pressure applied in various ways. The limit of the up-stroke depended on a crank connected to the revolving shaft. Attached to the shaft was a flywheel which operated similarly to the plunger on the Cornish engine.

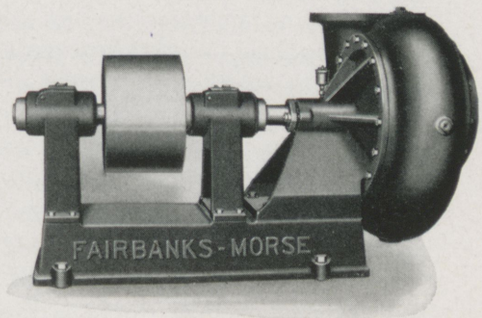
The rotative engine was followed by direct-acting steam pumps from which some of the present day pumps are an outgrowth. Henry Worthington, a New Yorker, worked with the idea and in 1840 he added the final touch to the long series of experiments connected with this type of pump. He made use of a single direct-acting steam pump which was attached to feed the boilers of a canal boat. The resulting action propelled the boat at a moderate rate of speed.

The centrifugal pump, which appeared in a crude form about 1818, made use of the rotary motion first studied in ancient times by the Egyptians. The centrifugal pump as it is known today may be described in this manner: "A centrifugal pump is an apparatus designed for raising liquids from one level to another, the necessary pressure being obtained from the velocity imparted by the blades of a rotating impeller." Although the centrifugal pump appeared in 1818, this was not the earliest date of its origin. Johann Jordan designed the first crude centrifugal pump in 1680. The first practical pump under this category appeared in 1818 and became known as the Massachusetts pump. An English firm made further progress in the centrifugal field and the manufacturing of centrifugal pumps on a large scale was inaugurated by them in the year 1846. The centrifugal pump is in general a high speed machine developed in collaboration with the steam turbine and electric motor. The turbine and motor provide a satisfactory drive and have aided in the development of the centifugal pump. This type of pump is now very popular because of the little floor space it requires, the low maintenance costs, and its flexibility. The essential parts of a centrifugal pump include a rotating wheel or impeller which is made either side suction or double suction, a volute which controls the flow of water, a shaft, and the necessary bearings and packings. The pump is operated in the following manner: water enters the suction piping, passes through the rotating wheel where it acquires great velocity at the center, and is discharged into the volute. The water then flows around within the volute until it reaches the nozzle of the pump where it is discharged. The rotating wheel functions to transmit energy to the water and the volute transforms this energy into pressure.

The centrifugal pump has appeared in many forms to meet specific job requirements. The volute centrifugal pump is simply a case where the guide vanes are omitted allowing the water to pass directly into the volute casing through a filling ring. Another type known as the trirotor volute pump is really a simple volute pump which meets the requirements for a low head but large capacity. The split-casing pump finds general use in sugar factories or gas plants where frequent cleaning is required.

When extremely high heads of water are to be overcome, the volute pump is generally replaced by a pump with diffuser vanes. This type of pump is known as a turbine pump. A diffuser vane is a gate used to control the flow of water. The discharge velocity of the turbine pump is quite high, and the diffuser is thus used to change this velocity to pressure head with little loss in efficiency.

The preceding paragraphs concerned with the evolution of the pump contain only a small portion of this interesting subject. Considerable research has been conducted in the field by such concerns as the Fairbanks, Morse Company of Chicago, Illinois. These careful investigations have resulted in a detailed description of the pump's development, but only the major improvements have been discussed here.



Courtesy Fairbanks-Morse

Modern Centrifugal Pump.

Courtesy Roads and Streets

Perspective of plain concrete arch on Indiana Highway.

Indiana's Highway System

By E. HAROLD STANFIELD, senior, c.e.

The highways of Indiana are known all over the United States by travelers to be some of the best in the country.

Mr. Stanfield discusses the highway system and its government in this article.

THE movement for the establishment of a state highway system in Indiana culminated in an act of the legislature during the General Assembly in 1917. This act provided for the creation of a state highway system which would extend to every county seat, and every city of 5000 or more population.

Two factors led to this action by the legislature; first, the recognition of a need for a uniform, state wide system of improved highways to make possible direct transportation between market centers and centers of population, and second, the establishment by the federal government of a fund to be alloted to the various states for the improvements of these highways.

The agency that sponsored the federal-aid funds was established by Congress in 1893. It was originally known as the Public Roads Administration, but since has been renamed the Federal Bureau of Public Roads. The Commissioner of Roads is the executive head of the bureau. The organization is made up of thirteen districts throughout the United States; each district being headed by a district engineer. The district engineer is charged with the administration and supervision of all federal-aid projects within his district.

The federal-aid fund is matched by the state on a fifty-fifty basis, the resulting fund to be spent under federal supervision on "federal-aid highways", the mileage of which must be equal to seven percent of the total road mileage of the state.

The original commission consisted of a chairman, four commissioners and a director-secretary. Members of the commission served on a part time basis with full time director-secretary acting as the executive officer.

One of the first duties of the commission was to designate main market roads. These roads were determined by taking into consideration lines of travel connecting main market centers and the kind and volume of traffic.

It was therefore necessary for the commission to make a personal investigation and inspection of the main roads of the state before any designation could be made. A number of inspection trips were made and approximately four thousand miles of roads were examined.

At the end of the first fiscal year five roads were designated as main market highways. They were: State Road No. 1 beginning at the Indiana-Michigan state line, extending South through South Bend, Indianapolis, Seymour, and Jeffersonville; State Road No. 2 beginning at the Indiana-Illinois state line and extending East through Valparaiso, South Bend, and Fort Wayne to the Indiana-Ohio state line; State Road No. 3 beginning at the Indiana-Illinois state line and extending East through Terre Haute, Indianapolis, and Richmond to the Indiana-Ohio state line; State Road No. 4 beginning at Evansville, and extending East through Jasper,

Mitchell, Bedford, Seymour, and Lawrenceburg to the Indiana-Ohio state line; and State Road No. 5 beginning at the Indiana-Illinois state line and extending East through Vincennes, Washington, Shoals, Huron, and Mitchell.

The new commission was soon involved in litigation attacking the constitutionality of the legislative enactment. The act creating the highway commission was held unconstitutional by the State Supreme Court in the Spring of 1918.

The original law was revised and re-enacted by the legislature in 1919; the enactment withstood court attacks. With the commission re-established, the work started in 1917 was resumed and a highway system of 3,200 miles was laid out.

The first construction contract letting was held on July 15, 1919. During the first year, 133 miles of road were under contract for improvement.

Extension and improvement of the state highway system progressed steadily. In 1923, the commission was maintaining 4,400 miles of State Roads and twelve years later, in 1935, 8,500 miles were under state maintenance. Today there are over 10,000 miles of highways and 2,400 bridges over 20 feet long in the state system.

In 1933 the General Assembly revised the law establishing the State Highway Commission. The new reorganization plan eliminated the five member commission and the director-secretary; the new organization consists of a three-member, full time commission with one member designated as chairman, all members being appointed by the governor of the state.

Subsequent to the change in organization, the new commission inaugurated a state-wide campaign for greater motor safety and a reduction in motor vehicle fatalities and accidents on the state highways. A program similar to the Civil Works Administration later set up by the Federal Government was initiated in the fall of 1933. This had the double purpose of increased motoring safety by widening narrow shoulders along state highways and of providing employment. At the peak this program gave employment to 26,000 men.

Photo by H. L. White

Scenic Highway view in Brown County, Indiana.

The chief engineer, appointed by the commission, is in direct charge of all branches of the highway organization. The organization consists of seven departments headed by the following: bridge engineer, engineer of road design, engineer of construction, office engineer, engineer of tests, engineer of maintenance, and manager of planning survey.

The activities of the commission are carried out by field forces working in six highway districts. Each district is divided into six sub-districts, the district office is in charge of a district engineer, while each sub-district is in charge of a maintenance superintendent. The commission maintains a garage and office in each sub-district.

An outstanding development in the highway business in Indiana in the past several years, has been the attention given to motoring safety. All programs and operations of the Highway Commission have been planned with the safety of the motorist in view. Shoulders and small structures have been widened on more than 1,200 miles of state highways with the result that head-on collisions on the widened sections have become infrequent; reflector signs and markers contribute to increased safety at night; many hazardous curves and grades have been eliminated by relocation; traveling surfaces have been widened; scores of highway railroad intersections have been eliminated by structures which carry traffic over or under tracks; flashing light signals are being placed at two

(*Continued on Page* 26)

Douglas C-54 Army Air Transport.

Courtesy Douglas Aircraft; Automotive and Aviation Industries

Post-War Commercial Aviation

By RICHARD C. MILHOLLAND, junior, c.e.

War conditions have brought about the necessity of moving freight rapidly. Ships have proven to be too vulnerable to the submarine and the possibility of air transportation is being tested.

Mr. Milholland discusses this war problem and also the possibility of using huge plane transports in the post-war era.

An authority on aviation recently stated "the impetus given to development and expansion of air transport by the war assures for it a new role in international commerce after the war."

In the face of already existing plans for closer world unity and revolutionary changes in post-war living standards the world over, it seems that the above statement must hold true if these plans are to be successful. Many of the pre-war barriers to international friendship and understanding are now being broken down through air linkage, bolstered by the needs of transporting war goods to our allies. After the war, this transport of goods can be expanded in the form of an air commerce, linking the United States with the remotest lands on the globe.

But these commercial aerial fleets will be composed of ships as advanced over our present commercial airliners in size and practicability as the present warplanes are advanced over the first fighting jalopies of World War I.

The nearest present likeness to this leviathan of the future is the Martin "Mars" flying boat, designed for use as a naval patrol bomber, which proved its possibilities in tests last summer. This forerunner of post-war ships is capable of carrying a deadweight load of 20 tons and weighs over 60 tons fully loaded. Placed on end, the wings would tower as high as a twenty story building. The ship can carry 150 men and fly to Europe and back non-stop, with a crew of only 11 men. Over the vast "bridge" in its fuselage are 2,175 cubic feet of space which is quite suggestive of tremendous loads. A staircase leads to the lower deck and wardroom while above are passageways to rooms behind the engines, where mechanics may service them in flight. Auxiliary motors drive eight electric generators. Each aileron is longer than the entire wingspan of the average pursuit plane.

The above facts serve to stimulate the construction of a plane twice as large, which has already been designed by Glenn L. Martin of the company bearing his name.

This 250,000-pound leviathan and others similar to it will be powered by six or more engines instead of the present maximum of four. It will compete with great ocean liners in comfort, for besides the numerous staterooms furnished with baths and showers there will be ample lounge space for table tennis or similar recreation, and observation rooms to afford the passenger a four-sided view of miles of panorama.

Present transoceanic operations are based on aircraft having a gross weight of between 87,000 and 84,000 pounds, carrying a payload of 4000 pounds for three or four thousand miles, depending on head winds and reserve fuel needed.

Now let's have a look into the economics of the future air transportation we are concerned with in this article. Taking as a basis the New York-London hop of 3500 miles, the customary London-New York plane must carry sufficient fuel for 4700 miles in still air because of 20-mile head winds, plus four hours' reserve fuel, the flight being made at nearly sea level to avoid the greater head winds of higher altitudes. The cruising speed would be 200 miles per hour. Under the conditions assumed, a 250,000-pound plane would carry a payload of 50,000 pounds, equivalent to 100 passengers with 80 pounds of baggage apiece, plus 25,000 pounds of mail, cargo, and express.

On the eastbound New York-London hop a 10,000 foot altitude would be maintained, taking advantage of the 30-40 mile per hour tail winds. The larger ship would

Courtesy Aviation

Loading Pan-American Transport.

cruise with a 60,000 pound payload at 230 miles per hour. The times for the two flights would be, respectively, 19 hours and 13 hours, which is faster than train time from New York to Chicago.

It is estimated that if the plane carries 75% of its maximum load, profits will be made if the passenger pays $225 one way, $400 round trip, which is slightly higher than correspondingly luxurious but much slower steamer transportation. Time should see air travel less expensive, about on a par with steamship rates.

That all first-class mail will be sent by air in the future is a foregone conclusion. Domestic air travel should boom after the war, especially since the safety of cargo airplanes is being proven daily as a result of successful transporting of thousands of troops and supplies as far away as the "land down under" and the neighboring Solomons. The doubt of safety which was characteristic in the minds of most people with the invention and development of other now common means of transportation is proved unfounded by recent National Safety Council casualty figures, which give the deaths per 100 million passenger miles for 1941 as follows: railroads, 7.1; automobiles and trucks, 6.4; airlines, 2.9.

Sparking this trend toward air travel will be the hundreds of thousands of young men trained to the air by the war, who will see no other means of transportation upon return to peaceful pursuits.

Let us now turn to the problem of transoceanic trade and commerce, involving millions of tons of manufactured products and native products from every corner of the earth which constitute the life line of commerce.

Much can be saved in time and money in this exchange of riches throughout the world by reverting from 10-knot per hour surface vessels to the 250 mile per hour cargo birds. Though shipment by ocean freighter carries with it a lower cost per mile, millions of dollars could be saved by doing away with such intermediate charges as export boxing, railway service, loading at seaboard, ocean freight, marine insurance, consular fees, duties, conditioning of such articles as food, and distribution.

Because of this fact air transport has acquired great favor. Transship-

(*Continued on Page* 26)

Courtesy Aviation

Modern Clipper.

Research and Development

Edited by C. PHILLIP BOWNE, junior, m.e.

Thinner Tin

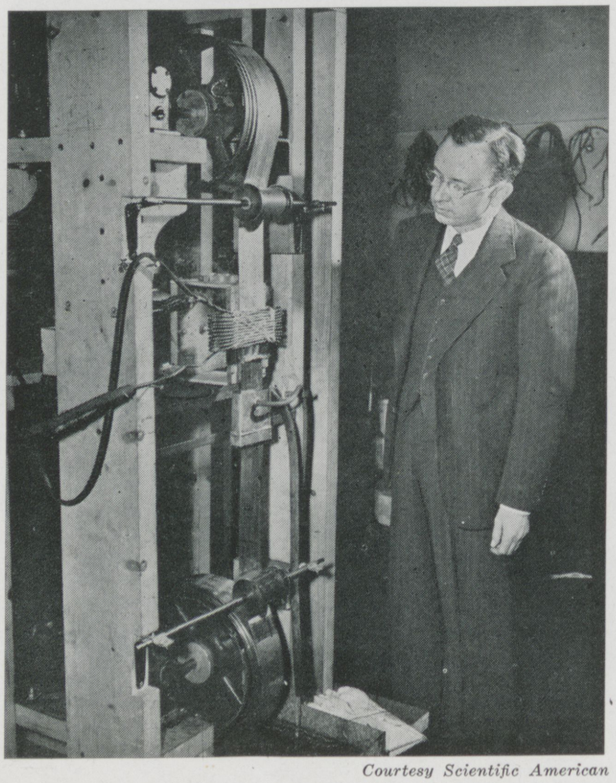
With sources of tin becoming scarce, a greater need of it made more pressing by war demands, and finally to have two-thirds of our supply cut off by the Japanese conquest of the Malay peninsula, the Dutch East Indies and Indo-China, we quite naturally seek means of conserving our diminishing tin reserve.

In applying the protective coating of tin to sheet iron, the sheets are dipped into the molten metal acquiring a very thin film of tin (about 90 millionths of an inch thick). To hot-dip 100 lbs. of sheet iron, 1½ lbs. had to be sacrificed, a number which, the government decreed, must be reduced to 1¼ lbs.

For some time the electrolytic process has been used giving an even thinner coating, in fact, any thickness desired. This process had, however, certain disadvantages. The plated surfaces acquired a gray cast quite unlike the shiny surfaces of hot-dipped tin, the result of irregular deposition of the tin, having an average thickness of 30 millionths of an inch. Portions of the surface were poorly protected and "suction-cup" action resulted because of these irregularities.

The solution to the problem, quite simple theoretically, gave rise to numerous practical complications. The solution: heat the metal to the melting point of tin, about 450° F, allow the tin to flow or spread out in a uniform layer, then cool to form a smooth, shiny surface. Complications: how to remelt the tin—reflow, the technical term—and cool it in the rapidly moving, modern electrolytic process.

In one method the plate may be heated by various means such as passing it through a radiant tube or heating by heat generated due to its internal resistance to an electric current, then quenching in oil. Since the rate of solidification in the oil bath is slow; that is, the oil cannot be heated to too high a temperature, and heat dissipation is relatively slow, a constant velocity ratio of 200 to 300 ft./min. must be maintained. The induction heating speed, on the other hand, may reach 100 ft./min.



Courtesy Scientific American

Mr. Baker demonstrating induction coil heater with laboratory set-up.

A newer version causes the plate to be passed through the induction coil heater to melt the tin, then quenched in water. Mr. R. W. Baker, Westinghouse engineer and inventor, explained its action as, "radio waves whipped round and round the metal, setting up counter currents near the surface and melting peaks down into the tiny valleys." He said that the waves "ripped" out electrons from tin atoms which crashed into other atoms with the resultant heat created from the collisions. As the strip passed out of the coil, the melting action ceased and solidification took place upon immersion into the water bath.

Reising Gun

A new weapon in three models, recently adopted by the Marines, and now being turned out in mass production, is the .45 caliber Reising gun invented by Eugene G. Reising. Two of the models are termed submachine guns, the third an automatic rifle.

The Model 55 submachine gun is distinguished by a short pistol-grip type stock plus a steel wire-hinged shoulder brace. Weighing only 7.65 pounds, fully loaded, it is compact and quickly loaded. The gun is adaptable by landing troops whether by water or parachute and may be used as a secondary unit in a tank fired through the tank's port.

Characteristic of the Model 50 submachine gun is a device called a compensator, an aid to the direction of fire. The gases are expelled in a direction counter to the motion of the gun. The gun has a conventional rifle stock.

Suitable for large scale interchangeable manufacture, the gun consists of a small number of parts and is simple to operate. Air-cooled, delayed blow-back, semi or entirely automatic magazine feed, the Reising may be fired in either of both hands or from the shoulder. Effective range

Courtesy Scientific American

Sister Mary Redempta showing her results in the fractionation processes in preparing biodynes.

of the fully automatic model with the shorter barrel is 300 yards; that of the semi-automatic and longer barreled is 400 yards. On the fully automatic rifle a thumb slide may be set at safe, SA (Semi-automatic), or FA (fully automatic). Although it has a cycle rate of fire of 450 to 600 rounds per minute, the box type magazine fitting snugly underneath the barrel and serving as a handhold, accommodates only twenty rounds 0.45 caliber ball or tracer type cartridges.

Mystery of Life Revealed

Perhaps bearing lightly upon engineering, yet to be of utmost importance to humanity, more so than ever in war time, is the miraculous discovery of biodynes (*bios*, life; *dyne*, force). Believed for more than a half-century to exist, these "intercellular wound-hormones" were finally isolated by Dr. George S. Sperti, director of the University of Cincinnati's Basic Research Laboratory and brilliant scientist who for many years probed the mysteries shrouding the growth and reproduction of the simple cell. Biodynes made their first public appearance cloaked in a salve which when administered to burns and open wounds immediately set to work the healing and rebuilding of tissue removing all traces of pain and leaving few or no scars. The search for the hormones began through the attempt to cure cancer.

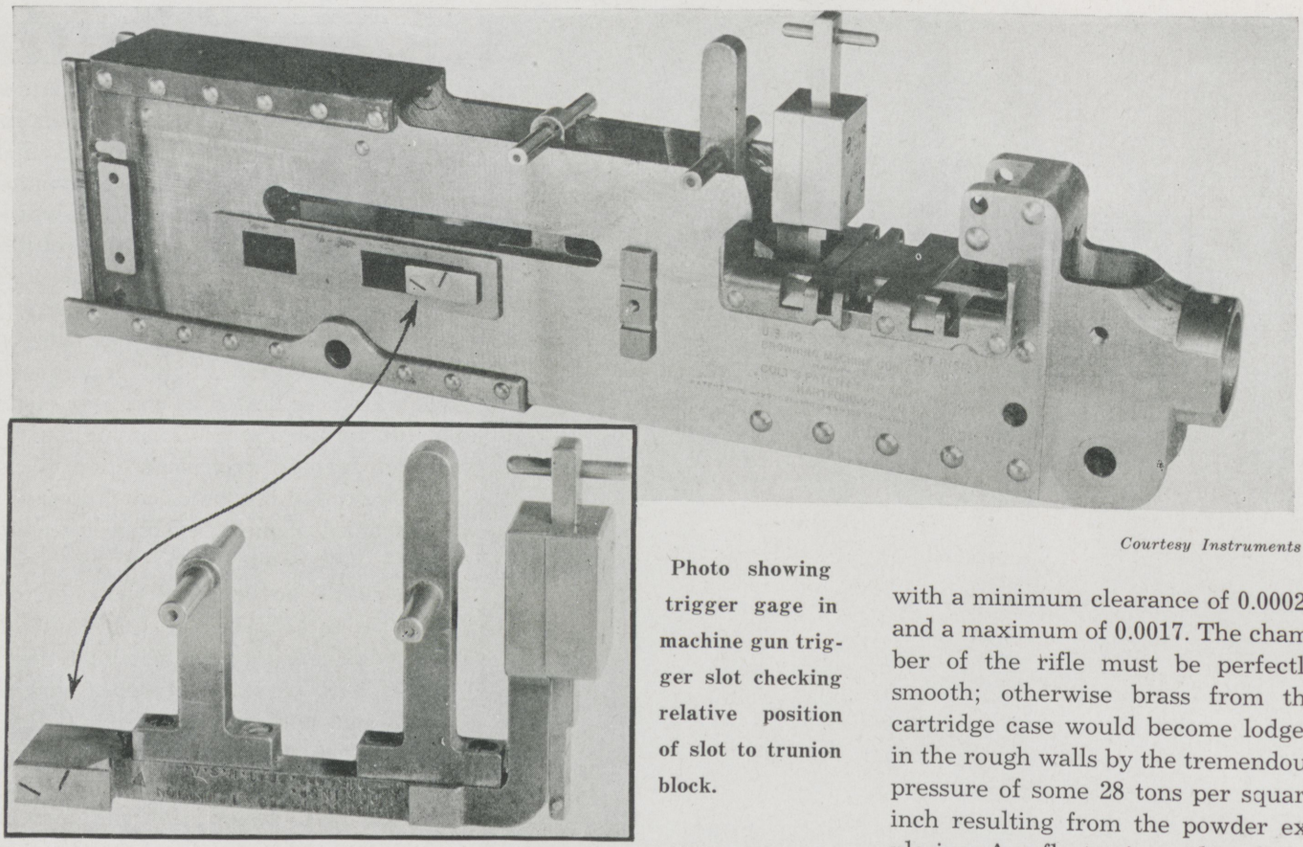
Dr. Sperti's problem was to isolate the cells and impart to them a wound without destroying them. He reasoned that by keeping the tissues under the correct intensity of stimulating, health-giving ultra-violet rays, conditions would be sterile enough to insure the preservation of life. An injury was inflicted upon the tissues of chick embryos, fish and animal livers under the protection of ultra-violet rays. The tissues were washed in solutions; then the cells were filtered out of the solution. Among these perfectly sterile surroundings the wounded cells should have secreted the reproductive chemicals which now should have been washed off and exist intact in the solution, providing reproduction had taken place. Cell tissues of a chick embryo were placed in the solution. Immediately cell-growth and reproduction were accelerated as was seen clearly under microscopic examination. Upon further experimentation it was found that if adverse conditions were created, namely; extreme intensities of ultra-violet rays or too severe wounds, no biodynes were secreted. This established the fact that only living cells manufacture biodynes.

There are several types of biodynes which perform decidedly different services. Besides those which promote the growth and reproduction of the cell, called the proliferation-promoting factor, there is the respiration-stimulating factor to stimulate the cell's breathing and the glycolytic biodynes which facilitate the cell's sugar consumption for energy. Many more will be unearthed with further research. Dr. Sperti's discovery will undoubtedly lead to many more which altogether will make the world of tomorrow a much safer place in which to live.

Machine Gun Inspection

Inspection standards on machine gun assembly lines are very exacting. Every part of the gun's integral working mechanism is carefully checked for dimensions and flaws. Why? Because while firing at rapid rates the gun undergoes extreme stresses which, if the mating parts were not closely aligned, would be greatly magnified eventually causing fractures.

Our .30 caliber water-cooled machine gun mounted on a tripod fires 500 to 600 rounds per minute and contains 189 pieces. The same machine gun mounted on motorized combat units or in airplanes as either a fixed or flexible unit, fires 1350 rounds per minute and consists of



Courtesy Instruments

Photo showing trigger gage in machine gun trigger slot checking relative position of slot to trunion block.

some 250 pieces. In the heavier 50 caliber class, both water-cooled and air-cooled, and used on practically the same vehicles as the lighter machine gun for heavier duty, ratings as high as 900 rounds per minute are reached, and more pieces are required for their construction than the smaller calibered guns.

Machining of the 30 caliber's bolt alone requires more than 100 gages and 100% inspection even before it is heat-treated, holes bored, ways ground and finished. Final inspection requires 32 gages to check the main points. Larger pieces are given 100% inspection for surface defects after annealing, toughening, and machining, in fact all parts are thoroughly checked except screws, pins, studs, and rivets which receive a fractional inspection of about 10%.

It is easy to understand that guns must function properly in action and that the greater their accuracy, the greater the efficiency of our armed forces; therefore time consumed in checking the parts before the guns are actually installed is well worthwhile. On the assembly line defective parts must be rejected without hesitation and good parts checked with precision. There is no time for checking with calipers, micrometers, or verniers; instead, precision gages must be used. For instance, correct timing is equally as vital to a machine gun as to an internal combustion engine. The trigger and trigger mechanism must be carefully gauged to insure exact firing without jamming. The trigger on a fixed aircraft gun is controlled electrically by a unit which may be clamped on either side of the body of the gun firing the gun from either position. Hence a trigger slot is provided on either side of the gun and the trigger gage, being symmetrical, checks both trigger slots.

If the firing-pin of the 50 caliber machine gun is not perfectly aligned, firing at a rate of 900 rounds a minute would snap it off. The simple gage used may be quickly and easily inserted into the shoulder of the firing pin. For every gun, five barrels are turned out. A drop-plug is used to see if the barrel is perfectly straight. The plug should drop freely with a minimum clearance of 0.0002" and a maximum of 0.0017. The chamber of the rifle must be perfectly smooth; otherwise brass from the cartridge case would become lodged in the rough walls by the tremendous pressure of some 28 tons per square inch resulting from the powder explosion. A reflector is used to detect flaws in the dark interior of the chamber. A device called a boroscope using the reflector principle is used to search for flaws at the middle of the barrel hidden from the eye.

Our air superiority may be largely attributed to the precision of these gages.

Spray Study

It is hoped that improvements in carburetor construction and operation to elevate the efficiency of fuel utilization will result from the study of the atomized fuel mixture within the carburetor. With the refinement of droplet size, instantaneous combustion will be more complete, thus the consequent increase in engine efficiency and performance.

Close analysis of the droplets no larger than 200 millionths of an inch or 1/30 the size of a pin head is accomplished with a spray analyzer invented by Samuel Gilman, a Westinghouse engineer. Traveling too fast to be caught with an ordinary camera, Mr. Gilman photographs the droplets in 10 millionths of a second, using a high-intensity flash generated by a 5500 volt spark gap. The drop-

Courtesy Westinghouse

Photographing Spray Droplets.

lets sprayed between the camera lens and the flash are recorded on the film as white dots since they stop an amount of light which falls on their projected area. In order to commensurate for the blur produced by the rapidly moving particles, a condensing lens was placed between the spray and spark gap. The lens concentrate the light on the camera lens such that only those droplets in the beam are protrayed on the film and the light which they refract has little blurring effect in the field of such high intensity light.

Using a pneumatic nozzle, air and water are mixed under pressure and thrown against a metal shield. A small portion of the spray passes through a narrow aperature in the shield and is directed through a channel to the beam of light. Immediately after the picture is taken the droplets are blown out through the channel in order not to fog the camera and condensing lens. The spray analyzer is adaptable to other liquid sprays.

Phosphor Fatique

Studies by Dr. N. C. Beese, research physicist at the Westinghouse Lamp Division, revealed from repeated test of various chemicals that phosphors are quick to lose their effectiveness. A phosphor is a chemical substance which has the ability to transform invisible ultraviolet radiation into visible light for use in fluorescent lamps.

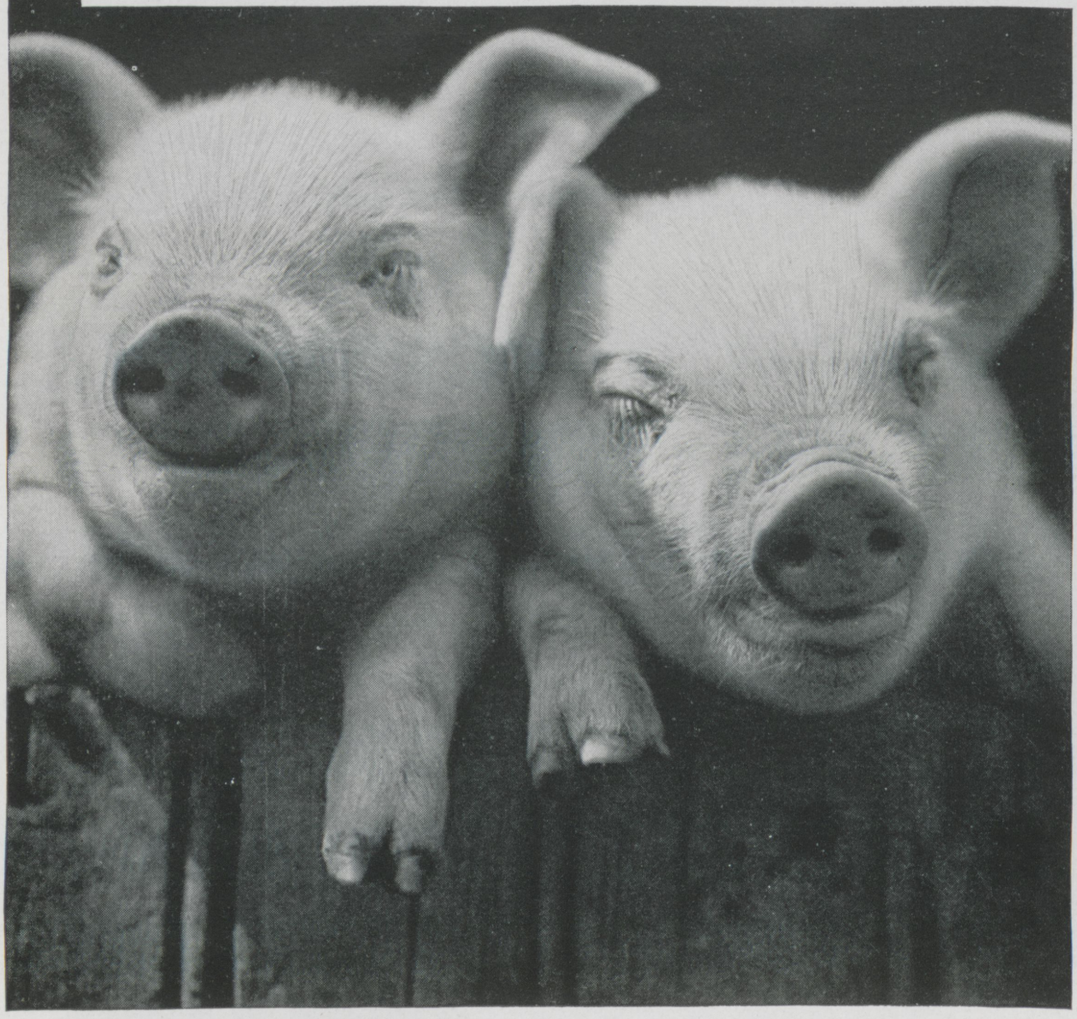
Dr. Beese's equipment consisted of a "black light" lamp which radiates its ultraviolet light through a water bath—to absorb any infra-red light present—to a plate of glass coated with the phosphor under test. Rays of light transformed by the phosphor fall upon a photo-electric cell with the resulting evolution and flow of electrons measured by a milliammeter. Test included ultraviolet radiations of different wave lengths and given time intervals after the light was first turned on. The test showed that the phosphors become less effective as a light producer with continued use, that they regain their effectiveness in a few minutes while not in use, that they fatique more under intense radiation than under moderate exposures, and that both the rate of fatique and rate of recovery were partially the functions of the wave length of the ultraviolet rays.

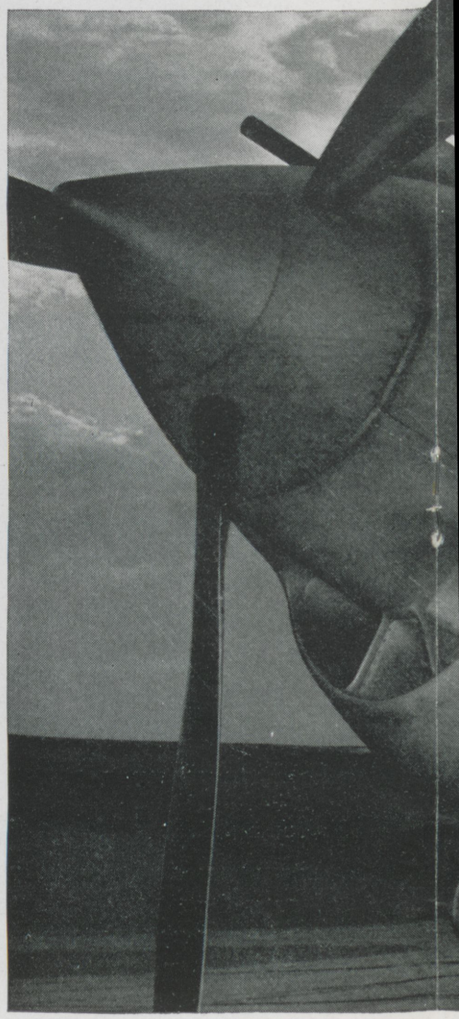
One phosphor, zinc silicate, was found to fatique quite rapidly, becoming 30% less effective in 10 to 15 seconds. Dr. Beese believes that fluorescent lamps may be improved by the proper control of the wave length of the ultraviolet ray.

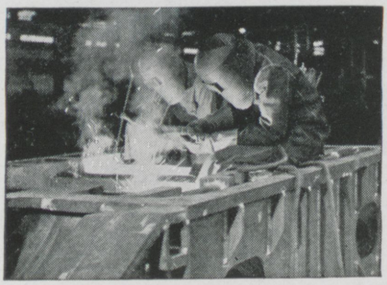
Courtesy Westinghouse

Measuring fatigue of phosphorous with photo electric cell.

Fatter Porkers...Faster







A-C Welders now work exclusively on machinery for the war effort.

ALLIS-CHALMERS FARM and milling equipment helps produce corn for U.S. porkers and steers . . . wheat for 8 of every 10 bread loaves produced in the U. S. A.

Allis-Chalmers *industrial* equipment (more than 1,600 different capital goods products) works in every war industry . . . helps produce planes, tanks, ships, guns at a rate which must make Hitler shiver!

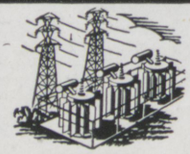
And Allis-Chalmers engineers—cooperating with plant engineers in every part of the country—are helping manufacturers *produce more*—not just with new machines, but *with machines now on hand!*

Every Allis-Chalmers man and woman is working *all out* for Victory. Our one job right now is winning this war. But from this war work we are gaining rich production experience which will be invaluable to the Nation when the war is over. We'll be ready to help build a better peace!

ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

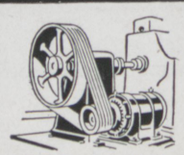
ALLIS-CH

OFFERS EVERY MANUFACTURER EQUIPMENT AND ENGINEERING CO—

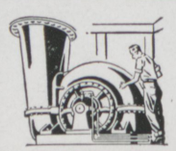


ELECTRICAL EQUIPMENT

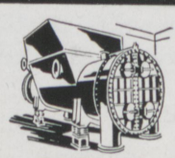
STEAM AND HYDRAULIC TURBINES



MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS



ENGINES AND CONDENSERS

CENTRIFUGAL PUMPS

Planes

. . . ALLIS-CHALMERS HELPS MAKE BOTH!

Allis-Chalmers makes the greatest variety of capital goods products in the world.

Rubber boats, tires, balloons are made with the aid of Allis-Chalmers equipment.

VICTORY NEWS

Inland Shipyards: Hundreds of A-C pumps, motors and V-belt drives are at work along the Great Lakes helping in the greatest shipbuilding activity this region has ever known.

Ore carriers, tankers, cargo vessels—even submarines—are being built here.

Tremendous expansion of facilities was required to meet the goals set—and equipment for the yards, as well as for the ships, has left A-C plants in great quantities.

YOU'LL WANT THIS HANDBOOK

New 16-Page Book applies to all makes of V-belts—tells how to conserve rubber through correct V-belt maintenance: how to measure proper tension; what determines "life expectancy"; what to do about worn sheaves; much other useful information. Liberally illustrated. Ideal for training new men. Write for your free copy.

New A-C War Plants: Two big new Allis-Chalmers war plants are now in operation "somewhere in the USA"...the second in a record 90 days after the ground was broken.

To save time and critical materials, wood construction was adopted for the newest plant. Practically the only metal used was in caps for the ends of trusses and columns. These were cast in A-C foundries to save time.

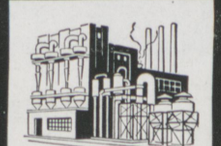
FOR VICTORY
Buy United States War Bonds

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

—OPERATION TO HELP INCREASE PRODUCTION IN THESE FIELDS...


FLOUR AND SAW MILL EQUIPMENT


CHEMICAL PROCESS EQUIPMENT


CRUSHING, CEMENT & MINING MACHINERY


BOILER FEED WATER SERVICE


POWER FARMING MACHINERY


INDUSTRIAL TRACTORS & ROAD MACHINERY

Tau Beta Pi Essays

Prize Essay
Why Study?

It has been said again and again that the knowledge we accumulate in college will be forgotten within several years after graduation. Why, then, do we spend hours and hours studying?

Assuming that good studying methods are followed certain abilities, talents, aptitudes, or attitudes may be developed. The degree to which they may be developed depends a great deal upon the individual. Concentration is something that is hard to achieve; it cannot be taught but must be developed gradually. One is usually not aware of the fact that he is increasing his concentrating ability himself; but it is widely accepted fact that proper studying can improve the ability to concentrate.

The ability to pick out the important facts from the non-important facts and to summarize them in a neat, concise, and understandable way is indeed valuable. If a student is able to do this it shows that he understands the material and has formed very definite ideas concerning the material. This is a constant aim of studying, to pick out the important facts, to summarize these facts, to understand the material, and to form definite ideas. Proper studying forces the student to do just this. It makes him use his mind. It teaches him not to be mentally passive.

A student with a passive mind will be able to memorize facts, but he will not be able to draw definite conclusions or to formulate ideas of his own—he accepts everything that is placed before him.

Good students study cautiously. They don't take the attitude of contradicting every statement the author makes, nor do they accept facts blindly and without reason, but instead they deliberate and reflect, scrutinize and question. They develop the ability not to take everything for granted without being skeptic.

Good students willingly accept correction and criticism for although they have self-reliance and self-confidence they also respect another person's opinion. Good students study with open minds, they attempt to throw out any wrong or prejudiced ideas they may possess. They realize the limitations of their knowledge—they realize what they know and what they don't know.

Any method of study that emphasizes the aforementioned qualities can be termed a proper method. Individuals vary so widely that no method could possible be devised that would apply to everyone. The student should try to develop new methods of study or adapt his old methods so that they stress the above points. But no matter what the methods of study the sole object is to gain wisdom, not knowledge. The student learns to think for himself. Once he has learned to think for himself it is but a short step to creative thinking. Isn't it worth it?

by Richard Mott

The Engineering Student and His Education

Have you ever stopped to think as to whether or not you convey the impression to people that you are a man of college training? When you come into contact with people for the first time they judge you upon your outward actions such as your speech, your ability to converse on different topics, your manners, your personal appearance, and in written communication with them, by your written English. Are you sufficiently proficient in each one of the above characteristics to make the grade? Many people, including educators and graduate engineers, believe that the four year enginering graduate is not proficient in some of the above characteristics, especially concerning the ability to speak on subjects other than those of a technical nature, the ability to address an audience, and the ability to write correct English. The other two characteristics, namely, personal appearance and manners are dependent upon environment and are not directly the responsibility of the college.

Since the engineering curriculum in most schools is limited almost entirely to technical subjects with only a sprinkling of English and public speaking courses, the students do not acquire sufficient training which will help them improve thmselves in the things mentioned above. Another detrimental aspect of the present engineering curriculum is that the time required for the study of engineering subjects does not allow the engineering student to get around with the "college crowd" so to speak and derive the benefits of such an association. The situation becomes more critical in a strictly engineering school from that standpoint since everyone talks engineering and there is no change to become engaged in "bull sessions" which are composed of students majoring in different fields.

Now suppose you feel that you are in such a predicament, what can you do to help yourself? There are numerous things that can be done. Allot your time intelligently so that you can devote more time to the social aspects of life and thereby develop your social graces. A straight A student without polish will not be able to impress people as much as a C student with polish. Join the staff of the college magazine or newspaper, take a more active interest in your social science courses, become affiliated with some organizations other than those of an engineering character such as the debating club and the glee club. Develop an interest in modern and classical music and use as much of your spare time

(*Continued on Page* 27)

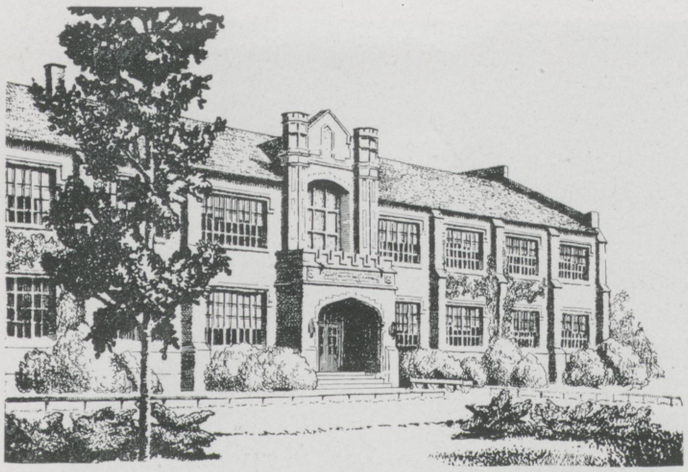
. . . in peace and war

This emblem is familiar throughout the nation as the symbol of a well-trained team, integrated for service in peace or war—The Bell Telephone System.

1. American Telephone & Telegraph Co. coordinates all Bell System activities.
2. Twenty-one Associated Companies provide telephone service in their own territories.
3. The Long Lines Department of A. T. & T. handles long distance and overseas calls.
4. Bell Telephone Laboratories carries on scientific research and development.
5. Western Electric Co. is the manufacturing, purchasing and distributing unit.

The benefits of the nation-wide service provided by these companies are never so clear as in time of war.

REMEMBER . . . WAR CALLS COME FIRST



Campus Survey

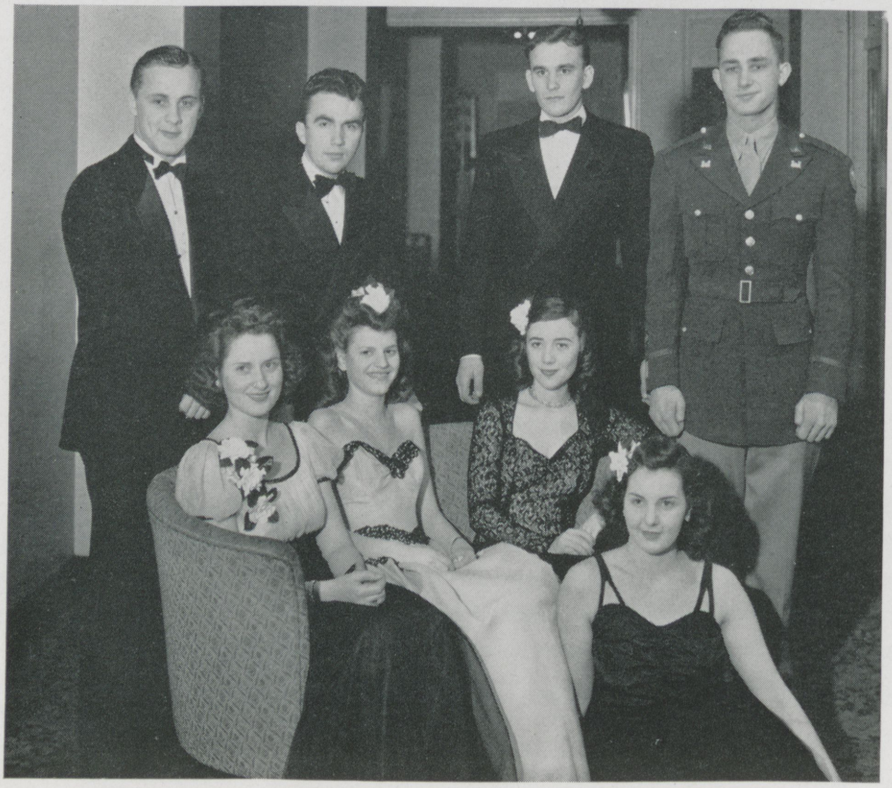
JOHN T. HARRIS, junior, c.e.

The Junior Prom

Climaxing the winter social season, the Rose Junior Prom was held Friday night, January 23, 1943. The dance was held in the Mayflower Room of the Terre Haute from 9:00 P. M. until 1:00 A. M.

Although the Prom this year was somewhat modified as compared with the Proms of other years, the old Rose spirit prevailed throughout the evening and made the dance quite a success. Danceable music was furnished by Maury Mahns and his orchestra from Purdue University. The vocalist, Darlene, was most entertaining; her rendition of "Sugar Blues", in particular, was very good. A huge grand march, led by the officers of the Junior class, was included in the festivities and added much to the color of the dance.

Approximately 350 persons attended the dance. The chaperones were Professor and Mrs. Carl Wischmeyer, Professor and Mrs. Clarence Knipmeyer, Professor and Mrs. Edward MacLean, and Professor and Mrs. John L. Bloxsome.



Prom Committee members and guests Misses Louis Wilson, Amy Dick, Bobbie Prior, Ruth Schrepferman; James Armacost, Russ Northam, Alan Winslow, Joe Valentine.

Tau Nu Tau Initiation

It is with the permission of William T. Weinhardt, president of Tau Nu Tau fraternity, that we print the proceedings of the recent Tau Nu Tau initiation.

The week of January 8, 1943 was designated by the senior Tau Nu Tau's to be initiation week for the incoming junior advanced R.O.T.C.'s. Preceding the night of January 15, for one week, the pledges were led through a veritable hell week. Everyone was compelled to wear his uniform all week and salute all the senior officers. A large, well polished apple had to be given to Lt. Colwell every day at the beginning of each military class. In addition, a drill was held every day at noon.

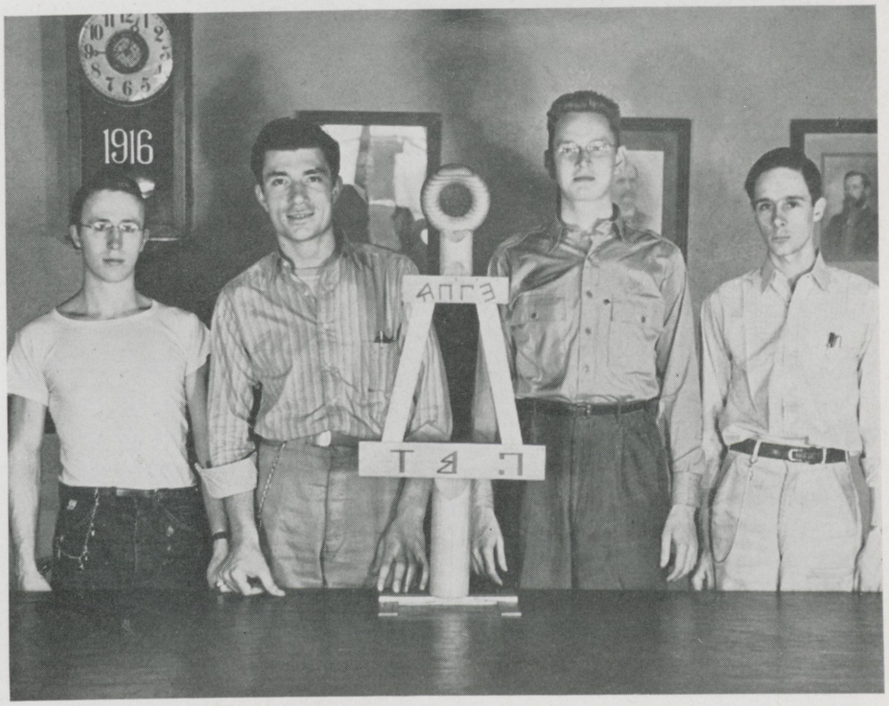
Initiation week culminated Thursday night. At 8:00 P. M. the aforementioned pledges assembled at the school building to begin an all night session. Things started off with an inspection followed by a 45 minute drill. A one hour military exam was given which would have taken the average man four hours to complete. Such questions as "Give one hundred titles an officer can have" were asked.

Following the quiz, the pledges were given two minutes to change to fatigues. A general clean up of the military basement and supply room then took place. Among other items, 69,000 rounds of empty cartridges were picked up. Following the clean-up period, the test papers were criticized by the upperclassmen. Bob Wright, who humbly suggested that the commando course, complete with packs, be run instead of taking such exams in the future, was detailed to climb the rope in the gymnasium twice from a sitting position.

Dick Ellsworth won the drill competition that followed. It was now 11:00 P. M. and after extensive drill, a special patrol consisting of rather rowdy characters including Wright, Pfrank, Peak, and Ellsworth were sent out to dig away the creek bank from around the rope swing on the commando course. Mind you, it was well below freezing and the ground was like granite. The campus was unusually well protected and no trouble issued from the Deming Den of Iniquity. The guard watched for two hours.

At 5:00 A. M., the order was calisthentics supreme and every contortion known to man was used on the pledgelings. By 5:30 A. M. reactions were purely mechanical as all were extremely wobbly by now. Then came refreshments consisting of doughnuts, sandwiches, and coffee. At 6:00 A. M. the class was formally initiated.

The members of the pledge class are: Dean Albon, Kenneth Allison, Robert Calvert, George Edwards, Richard Ellsworth, Harry Frye, Richard Garrett, Vinton Haas, Robert Howell, Raymond Kopan, James Neerman, Frank Peak, J. Francis Pfrank, Joe M. Valentine, Frank Winters, and Robert Wright.



Tau Beta Pi pledges Gordon MacBeth, Michael Percopo, Frank Peak, Richard Mott.

Rose Athletic Banquet

The annual Rose Athletic Banquet was held Thursday evening, January 23, 1943, at the St. Stephen's Episcopal Church. Three years ago the first athletic celebration of this kind was held and since then the banquet has become tradition.

To start off the evening, by popular request, Bill Kniptash gave his famous rendition of "Pray For The Lights To Go Out" and Stan Smith, ex-May '44, and Jim Hegarty gave an amusing imitation of Dr. Sousley and student, both of which practically caused a riot.

Following the meal, Bill Rumbley, president of the senior class and captain of the past season's football team, introduced Mr. L. V. Surtees as toastmaster of the evening, the sports editor of the Terre Haute Tribune, and Mr. Sterling Pittman, Rose '22, principal speaker of the evening, who spoke on the value of hard work in the successful pursuit of any vocation. Also speaking were Mr. Richard Aitken, president of the Rose Alumni Association and Mr. Verne MacMillan, mayor of Terre Haute, who presented Ed. McGovern, Rose halfback who led the nation's scoring last year, with a beautiful "R" blanket on behalf of a group of local fans. Then Phil Brown gave a colorful review of the year's athletic achievements and, following, showed moving pictures of the Rose-Earlham football game and various other Rose sports events that took place last year.

Tau Beta Pi Initiation

The traditional brain wrecking initiation of Tau Beta Pi, national honorary engineering fraternity was held on the night of January 7, 1943. The initiation was characteristic of all Tau Beta Pi initiations with the usual apparently insoluble problems and difficult missions required of the initiates in the presence of the brow beating actives.

Having completed their preliminary initiation, the pledges were formally admitted to the ranks of the fraternity on January 13. A dinner for all Tau Beta Pi members was held at Deming Hall following the formal initiation. At a recent meeting the officers for the ensuing year were elected as follows: president, Frank H. Winters; vice-president, Vinton B. Haas; recording secretary, Gordon MacBeth; and corresponding secretary, Richard C. Ellsworth.

Basketball Team – by J.H. Hawes

Due to wartime travel difficulties, no schedule had been planned for the 1942-43 basketball season; but, in order to give the students a chance to participate in the sport, Phil Brown arranged for candidates to start practicing late last month.

The prospects, due to the inexperience of the men, are far from bright. However, as the main purpose of the team is to permit the members to play for their own enjoyment, the season will probably be a success. Lettermen from last year's strong team include Co-captains Bill Kniptash and Dick Ellsworth, and Ted Kadel. Other men returning from

(*Continued on Page* 25)

Cross Section

By JAMES HANES, junior, ch.e.

Donald Lo

Donald Lo probably takes all honors among Rose men when it comes to a colorful and interesting background. Don has the distinction of being the only student at Rose from Hawaii. His experiences, both in Hawaii and in the States, make him an ideal subject for this column.

Donald Lo was born in Honolulu, Hawaii on November 2, 1919. He is of Chinese ancestry. Don went through the public schools in Honolulu, which are very similar to the ones here. Upon completion of high school, Don entered the University of Hawaii at Honolulu. While attending classes at the University, he worked as an accountant, part time, for the Hawaiian Pineapple Co., subsidiary of Dole Pineapple. During the summer Don worked for the same company holding a full time job. In 1941 Don received his A.B. degree in economics and business, and entered Rose in the fall of that year, as a sophomore.

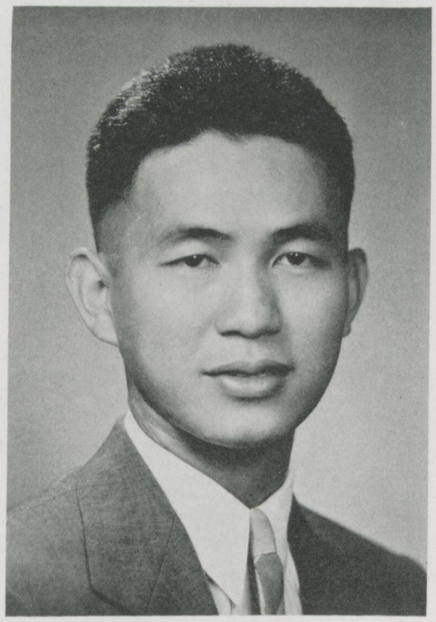
Concerning Hawaii Don said that the temperature has never been recorded higher than 88° or lower than 56°, and the relative humidity is fairly constant. These ideal weather conditions make possible a year round season for outdoor sports. Don has had much experience playing football, basketball, and tennis (all barefooted). Some of the main sports in the islands are swimming at excellent beaches; surfboard riding; deep sea fishing; mountain climbing; skiing on mountain tops; and ice skating on artificial rinks. Don says that one reason celebrities like Honolulu so much is the fact that they do not attract the attention there that they do in other places, making possible real relaxation.

Although he has only been gone from Hawaii since 1941, Don has seen more of this country than most

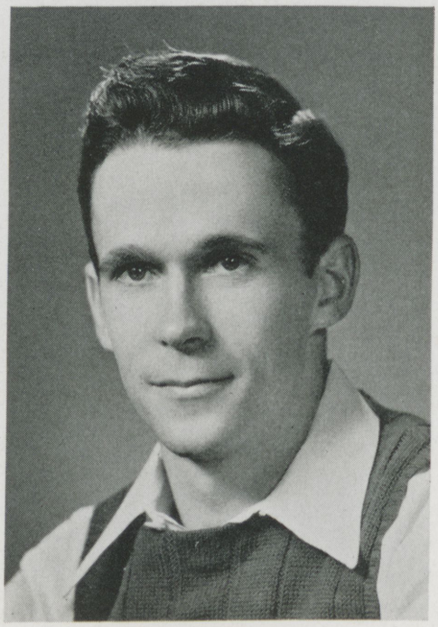
(*Continued on Page* 29)

This month's cross section articles present two personalities of much interest. Mr. Lo is a native Hawaiian who is now in his senior year. Don is a member of the Civil Engineering Department.

George Blakey, another senior, hails from Kentucky. George is a member of the Mechnical Engineering Department.



Donald Lo



George Blakey

George Blakey

George Blakey is another Rose man who, although working his way through school, has found time to participate in extra-curricular activities. He has travelled extensively in this country, having been in all of the states except those northeast of New York.

George was born in Russellville, Kentucky, on November 20, 1916; and he made his residence there until after he had graduated from high school. During the summer vacation, at the close of his sophomore year in high school, George worked in the fluorspar mines at Russellville. During his next summer vacation George took a 10,000 mile trip through the west and into Mexico and Canada. He did his travelling on trains and busses, stopping at all points of interest along the way. During that summer he saw the Pacific fleet on maneuvers off both California and Washington; the San Diego Centennial; and the Grand Coulee dam under construction. George spent a month in Washington, thinning in the apple orchards.

After graduating from high school, in 1936 George worked in the fluorspar mines again, until August. In August he again went west, spending three months in Texas, New Mexico, and Arizona. This time he visited the Centennial at Dallas, Texas. At Pheonix, Arizona, George took a night course in clerical work. After three months in the west he accepted a position in the shipping department of the Elder-Conroy Hardware and Furniture Co. in Clarksville, Tennessee. While employed by the hardware company, George worked his way up to assistant bookkeeper. In the spring of 1939 George became acquainted with a Rose alumni, N. C. Blair of the class of '34. With the cooperation of Mr. Blair, George obtained a job

(*Continued on Page* 27)

This is the way to win a battle in the desert

Libya and North Africa made it clearer than ever: THIS IS A WAR OF SUPPLY.

In 1918, an American soldier could be equipped and maintained on 5 tons of supplies each year.

But today, for every soldier sent abroad, *10½ tons* of shipping space must be provided for *equipment alone*. And it takes an additional *18 tons of shipping to supply a single soldier for a year!*

Supply is a matter of *ships*.

And ships need electricity.

Vast quantities of electric power, for a thousand vital tasks that must be done to take a convoy safely across the seas...

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Electricity in every freighter, every tanker, every Navy escort vessel—to help win the war of supply!

We of Westinghouse take tremendous pride in building so much of the electrical equipment, so many of the great turbines and gears and electric drives, for the ships of America's Navy and Merchant Marine.

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PLANTS IN 25 CITIES — OFFICES EVERYWHERE

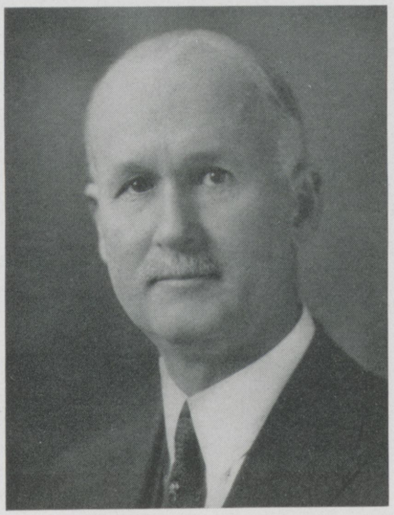
Alumni News

Edited by ROBERT GREGER, soph., ch.e.

Alonzo John Hammond

Alonzo John Hammond, Rose '89, Heminway Medal, M.S., C.E., and D.Eng., has been awarded honorary membership in the American Society of Civil Engineers. Since graduation Mr. Hammond's professional career has taken him progressively closer and closer to Chicago. He spent almost another decade even closer to Chicago, as city engineer of South Bend, Indiana. In these positions the usual variety of city engineering fell to his lot—especially the water works and other utilities incident to a rapidly expanding community. He also did architectural and engineering work, notably a number of bridges for the County of St. Joseph, one of which was a plate girder with an approach having a cantilever reinforced-concrete sidewalk, a pioneering design at that time. Other projects were two hydroelectric plants in the St. Joseph River, one of them involving an intricate case of backwater and the eventual establishment of a uniform regulation of flow. He also served as chief engineer for an interurban railway, locating, designing, and constructing some sixty-three miles of lines. In addition, he designed the steel frame of a ten-story bank building for South Bend's Union Trust Company, of which he was vice-president.

Starting in 1910, Mr. Hammond began a long and varied experience of important engineering work for the City of Chicago. He performed several months of testing, measurements, and calculation with respect to the fourteen-foot tunnel being constructed at 73rd Street out into Lake Michigan to the four mile crib. His recommendations resulted in radical changes in the character of tunnel work done in the city. The following year, as chief engineer of the Chicago Bureau of Public Efficiency, he made a survey enabling



Alonzo John Hammond

the city to take ample provisions for protecting its water mains against severe electrolysis.

In 1912 he was appointed engineer of bridges and harbors for the city, to build an organization for handling a great volume of new construction and to approve the design of new bridges provided for by a large bond issue. Notable among these was the Michigan Avenue double-deck bascule which, with its approaches, comprised an $8,000,000 project. One feature of his work was the development of continuous rail joints on the bascules, which were not only conducive to the comfort of car passengers but to the life of the bridges.

Previously, in Indiana, Mr. Hammond had had considerable experience in connection with rail terminals. But in 1914 he started a series of such engagements in earnest. In fact this type of work took much of his time in the succeeding twenty-five years. He was engaged first as consulting engineer by the Chicago Union Station Company to prepare preliminary plans for the new passenger terminal. The work involved redesigning the trunk-sewer system within a two-mile zone along the Chicago River, the realignment of underground utilities, and preliminary studies for nine solid-floor viaducts. He continued with this company as assistant chief engineer in charge of engineering design and construction of this $75,000,000 terminal until 1922. It is a great and impressive monument to his engineering ability.

From 1922 to 1928 he was with private construction companies on hydroelectric plants, roads, bridges, and buildings. His consulting practice, begun in 1928 in Chicago, has since been continued. Particularly he has specialized in rail terminals, general structural engineering, and city planning. An enumeration of some of the clients he has served will give an idea of the scope of his efforts—Chicago, of course; Sioux City, Des Moines, and Cedar Rapids, Iowa; Pittsburgh and Philadelphia, Pennsylvania; and the Minneapolis and St. Louis Railroad Company, as well as other railway systems.

In war service, beginning in January 1941, he has held positions of national prominence, first as consulting engineer to the Chief of the Construction Division, War Department, advising on camp construction. A short time later he was appointed as a member of the Construction Advisory Committee, later merged into the Construction Contract Board of the Construction Division, War Department. Only last July he was assigned to duty with the Price Adjustment Section, Construction Division, acting as deputy chief of the section. Here he has been engaged in the renegotiation of all contracts with the War Department.

For years Mr. and Mrs. Hammond have lived in Evanston, Illinois. Their children are now married and one, Mr. Hammond's namesake, is on active duty as a lieutenant commander in the Navy.

Chicago Rose Tech Club

The Chicago Rose Tech Club will hold its annual meeting on St. Patrick's Day, March 17. Any Rose alumnus in the vicinity of Chicago is requested to correspond with Mr. C. A. Anderson, 208 West Washington Street, Chicago, Illinois, with regard to the meeting.

In The Service

'31 Harry J. Loving, ch.e., with honors, is now a major.

'40 Robert M. Ripple, c.e., of Staunton, Indiana, recently graduated from the Enigneer School, Fort Belvoir, Virginia, as a second lieutenant in the Corps of Engineer, Army of the United States.

'42 Marion B. Foley, ch.e., is a 1st Lieutenant.

Marriages

Richard W. Powell, e.e., '39, was married to Miss Dorothy Marie Johnston January 9, at the First Baptist Church in Terre Haute. Miss Johnston has been teaching in South Bend, Indiana, since graduating from Indiana State Teachers College in 1940. Mr. Powell has been employed by the American Bridge Company of Gary, Indiana since graduation.

John T. Newlin, c.e., '43, was married at St. Patrick's parsonage, December 27, 1942, to Miss Marjorie McCandless. Mr. Newlin's brother, Charles, was best man. Mr. and Mrs. Newlin are residing at 244 North 14th Street, Terre Haute, Indiana.

Richard A. Holthaus, ch.e., '43, and Miss Eleanor Louise Stark were married January 24, 1942. The wedding was held at the Emmanuel Lutheran Church, and John T. Newlin was best man. The couple will be at home to their friends at 441 South Sixteenth Street.

New Arrival

Harmon E. Rose, c.e., '43, announces the birth of a daughter, Elizabeth Carol, born December 24, 1942.

CAMPUS SURVEY

(*Continued from Page* 21)

~~speakers were Mr. Bob Nesbit,~~ last year's squad are Loser, Tingley, Fox, and Hillenbrand.

Glee Club Activities

The Rose Poly Glee Club, under the direction of Mr. Emil Taflinger, climaxed a very successful year with the presentation of their final concert at the Student Union Building, Indiana State Teacher's College, on February 5, 1943. Prior to the final concert the club presented a series of recitals at the various high schools and social organizations about Terre Haute. No out of town engagements were scheduled because of the gasoline shortage. The schedule of presentations was as follows:

December 14—Gerstmeyer Technical High School.

December 16—Garfield High School.

January 14—Women's Department Club.

February 5—Woodrow Wilson High School.

February 5—Indiana State Teacher's College.

At a recent meeting the election of new officer's was held with the selections made thus: Frank H. Winters, president and Jay Kress, business manager.

INDIANA'S HIGHWAYS

(*Continued from Page* 9)

hundred other highway-railroad intersections; and several divided-lane highways have been constructed with preparations completed for building other divided-lane highways. These parallel strips of pavement, separated by a wide parkway, will eliminate many collisions, the blinding of drivers by approaching lights, and many other hazards which even four-lane roads have not reduced materially.

Indiana's highway department is one of the few state highway departments that has no bonded indebtedness. The funds for the operation of the highway department are secured through vehicle tax and gasoline tax. The cost of operating the highway system is approximately $20,000,000 per year. Any excess in that amount collected from vehicle and fuel tax is reverted back to the municipalities for use in street improvement.

POST WAR COMMERCIAL AVIATION

(*Continued from Page* 11)

ments of air-borne goods will become less frequent, so that products will be sent from centers of production to the location of the buyers with less handling and warehousing. Anyone knows that a larger demand for a product can be created by decreasing the cost. It is this factor that will be welcomed as a means of advancing living standards the world over through a greater abundance of goods everywhere.

At present it is not at all uncommon for goods selling at $100 in the United States to sell for twice as much at some foreign point.

Taking the rates of cargo planes and ocean-going vessels at about 250 and 10 miles per hour, respectively, a ratio in time saving of 25 to 1 is expected. Thus the money represented by air-freighted products is tied up only one twenty-fifth the time that on the sea is, resulting in an enormous reduction of interest charges.

It is said that today the globe is 518 times smaller than in the sixteenth century and twice as small as in 1938. This should help us to envision the world of tomorrow, it being a matter of only a few short years, when no point on the globe will be more than twenty-four hours away.

Today, a child dies from an unusual malady. Tomorrow that child would have lived, thanks to some rare medicine, or special operating equipment sent flying across the skies.

Today, we cannot eat out of season. Tomorrow, all foods, will be available in a few hours through the medium of air transportation. Incidentally, no refrigeration is needed 20,000 feet above the earth.

In the years after the war many millions will migrate from the burdens of dictatorship especially from Europe, where misery, hunger, and loss of homes and families will prompt them to seek a more abundant life in now virtually isolated areas rich in wealth—all expecting to be served by the airlines.

The greatest developments will come in South America, where conquering the Andes and jungles of Brazil by air will reduce weeks to hours and extend her empire into the vast interior, equal in area to that of the United States.

Airlines will lay open the water power, agricultural regions, and fine climate of Southern Rhodesia to the world, as they will make interior Australia's coal and iron deposits available. India and Canada, having extensive resources are ripe for a commercial invasion by air.

Tomorow, it will be north to the Orient, over Alaska to India, over the North Pole to Moscow, across

Greenland to England. The nation which most fully develops economical air transportation will carry the world's commerce.

Talk of converting "Fortresses" and other large military aircraft into cargo ships after the war does not seem logical technically or economically. While large bombers are built to carry great loads, these loads are all concentrated in the shape of armament, while a cargo ship must have a huge cubic capacity and strongly reinforced floors.

In the years following the present world conflict, the airlines will help to rehabilitate a worn-out world, as well as re-establish broken threads of commerce. As this war has been largely determined by air power, so must a lasting peace have its foundation laid upon strong aviation facilities for bringing the peoples of the world together.

GEORGE BLAKEY

(*Continued from Page* 22)

in the dormitory, and entered Rose in the fall of 1939.

During the summer vacation of his freshman year, George worked for the Elder-Conroy Co. again. The second vacation, however, found Blakey working as instrument man in the coke plant of the Carnegie-Illinois Steel Co. at Gary, Indiana. This past summer, due to the accelerated program, George stayed in school instead of working.

While in Rose, George has been president of his freshman class; president of the dormitory association for two years; head waiter in the dormitory for three years; secretary-treasurer of the junior class; and a member of the A.S.M.E., Theta Xi fraternity, Rifle Club, and Glee Club.

George has 66 hours of flying time, and he had planned on becoming an army pilot. He has now accepted a position, starting in June, as Junior Field Service Engineer in the aeronautical division of the engineering department of the Sperry Gyroscope Co. in Brooklyn, New York.

TAU BETA PI ESSAYS

(*Continued from Page* 18)

as possible for good reading purposes. By doing some of the above mentioned things, not only will you enjoy your four years of college to a greater extent, but you will also be improving those outward actions upon which people are impressed.

What part can the engineering schools play to help broaden the field of knowledge of the student? At the present time with the four year course the schools can not do very much since it is hard enough to teach all the technical subjects needed to give the student a good basic engineering education. Perhaps some day in the future, when the need of a more general education on the part of th engineer becomes more evident, all the engineering schools will operate on a six year basis to make room for the vitally needed humanities.

by Michael Percopo

Fraternity Notes

Sigma Nu

A novel open house which had the present war as its theme was the first social event to be held by the chapter in the past month. All of the hazards of war—includng a blackout complete with air raid wardens and a copy of Coach Phil Brown's nightmare—the obstacle course—were to be found in the house.

The annual farewell banquet which is given in honor of the graduating seniors was held on Sunday, February 7. The Sigma Nus who are graduating are: Gene A. Coltrin, Jack Warrick, and Bob Mitchell.

The chapter supported the Junior Prom and the Athletic Banquet almost had a one hundred per cent representation.

The following men, who are members of the Air Corps Reserve have been called to active duty: John Martin, Paul Jewell, and Bill Phillips. Francis X. McDonald is going into active duty with the Marine Corps at the end of the present semester. The chapter is very proud of these men and wishes them the best of luck in this, their biggest venture.

Theta Xi

Two weeks before the close of each semester, new officers are elected at Kappa chapter. The new term of office will be from February to May. The elected officers are, Russel Northam, president; Kenneth Allison, vice-president; Harry Frye, treasurer; Ed Mollar, house manager; Walter Vander Veer, assistant house manager; and Jim Milner, corresponding secretary. The officers of last semester were, Dean Albon, president; George Blakey, vice president; Russel Northam, the newly elected president, was treasurer; Ed Mollar retained the office of house manager; Paul Kaplan, assistant house manager; and Richard Pence, corresponding secretary.

Two members of Theta Xi, Jack Joyce and Tom Keogh, were called to service in the army. Joyce was a sophomore chemical, and Keogh, a new T. X. initiate, was a freshman. A large number of the chapter's members are in the Enlisted Reserve Corps, but the outlook of the men towards completing their education has not slackened, for every one wishes to make the best of the existing opportunities.

In the field of recreation, the chapter has organized two new bowling teams, which have a promising outlook for a successful season.

Lambda Chi Alpha

On February first the Theta-Kappa Zeta of Lambda Chi Alpha held a dinner meeting in honor of the two men graduating from the chapter this year, Harry Raymond Wilson of Brazil, Indiana, and James Sidney March of Wheaton, Illinois. We congratulate these men and wish them the greatest success in their respective fields, but we are very sorry to have them leave our midst.

After the dinner meeting on February first an election of officers was held. The results are as follows: President, Ralph Mitchell of Salem, Indiana; Vice-President, F. Richard Roesinger of North Hollywood, California; Secretary, Willis Rose of Connersville, Indiana; Treasurer, Lowell Smth of Harrison, Ohio; Social Secretary, Daniel Morisseau of Pacific, Missouri; Ritualist, Robert Greger of Terre Haute; and House Manager, Donald Alexander of Richmond, Indiana.

Well, it happened again. Another girl is now wearing the distinguished badge of Lambda Chi Alpha. Congratulations, Brother Soudriette.

We've had a report like this to make for the past four months. Step up, Brothers! Who'll make it five?

We report that our dog is getting bigger and becoming a more active member in the chapter house every day. Some day he will quiet down, we hope.

Alpha Tau Omega

The Gamma Gamma Chapter of Alpha Tau Omega is happy to announce the marriage of brother Richard Holthaus to Miss Eleanor Stark of Terre Haute. The wedding took place January 24, at the Emmanual Luthern Church. It was a military wedding with several fraternity brothers assisting. The couple left the church under crossed sabers held by A. T. O.'s taking advanced military.

A stag party was held January 29 to celebrate the marriages of brothers John Newlin and Richard Holthaus.

DONALD LO

(Continued from Page 22)

of the permanent residents. His trip from California took in most of the western states, and at each of the vacations, since he cannot get home, he has traveled around the country. He has been to Niagara Falls, both American and Canadian sides, Boston, New York, Washington, D. C., and most of the East. While in Boston, he definitely decided against ever becoming a doctor after watching medical students work on a cadaver for four hours and witnessing eight operations in two days. On his next vacation Don plans on seeing the South, especially New Orleans.

On December 7, 1941 a bomb burst within 500 yards of Don's home in Honolulu. It happened to fall on some vacant land so that no damage was done. He was happy to learn that all of his friends and relatives were unhurt.

Don chose Rose because he wanted an engineering education, and some of the outstanding engineers in Hawaii are Rose graduates. Don figures that with an engineering education and his business degree, he can better cope with any problem he may meet. However, at present he thinks that there is a possibility of going on to Cornell and getting an advanced degree. He doesn't want to put all of his eggs in one basket. Don's ideal position would be one that combined both his engineering and business backgrounds, and it would preferably be in Hawaii.

What You Should Know About Modern Engineering

Girls, on the whole, are divided into three divisions, queens, girls with figures, and the kind I go with. Queens may be subdivided into two classes; ones with legs and ones with legs they can use. Unfortunately, those of the latter group are as yet unclassified and tabulated although some data has been taken by cornering a few in closed places such as telephone booths and closets. Those few misguded queens who still believe the propaganda spread by anxious Arts students in order to keep them home are being brought to their senses by the manly and gentlemanly acts shown them by engineers.

For instance, the stooped posture of the engineer, long thought to be used for sniping more efficiently but in reality used in order to get a better look at the queens legs and at the same time being prepared for the pursuit, has been abandoned for an erect stance. This courtesy, as well as giving a queen a sporting head start, heightens the pleasure of the quest since the queen is not altogether sure that she has been chosen as fair game. For this reason, a covey almost always sits pat until there are enough engineers to flush it.

With the coming of gasoline rationing, it is impractical to use the old trick of running over an Arts student then confiscating his queen, then too the bloody bumpers on the car do not look so well when one applies for a "B" card. Some enterprising engineers have come to combing their hair, washing their faces (only as far as the neckline), and talking as a soprano thus creating the allusion that they are Normalites. Dressed in this manner, it is a comparatively easy task to get within arms length of a queen before she smells the cheap liquor so characteristic to an engineer.

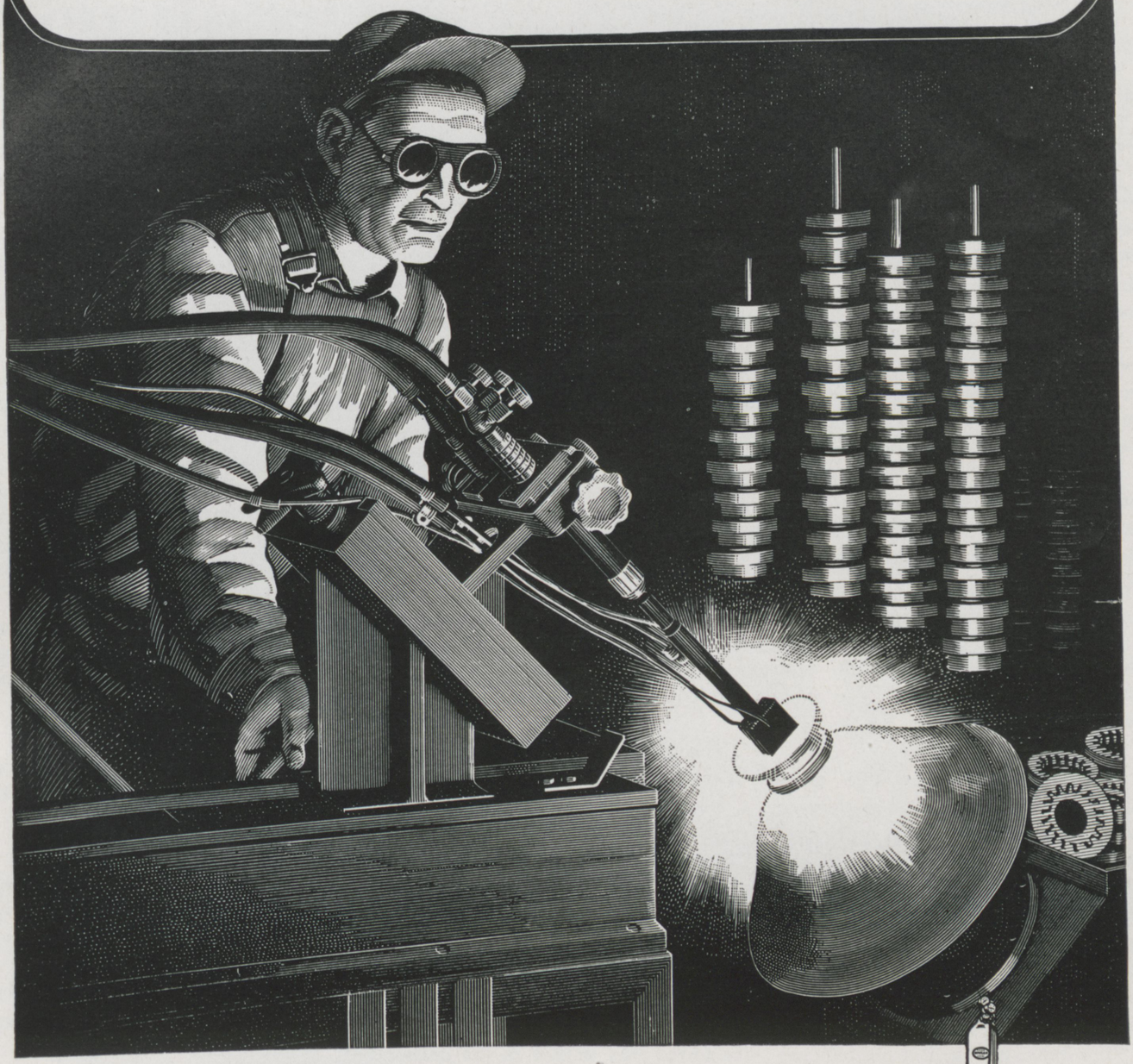
Bathing in rose water eliminates this odor so loved by the true engineer but the effect is as bad since one so bathed smells exactly like an Arts.

Probably as much harm is done to the prestige of the engineer by the unexperienced freshman as by the malicious rumors spread by Art students to the effect that engineers are really fugitives from Darwin. Somehow, these amateurs reach the field of play before their more experienced upperclassmen and scatter the flock thus necessitating organized searching parties of upperclass engineers. The freshmen usually trail after these parties in the hope that the pack will throw them a semi-queen that they have tired of. These amateur's crude methods of attack are sure to point them out as novices. The new wolf is almost certain to tip his hat or to run on the correct side of the queen. These practices, as well as the habit of referring to a queen as anything but a broad, are not to be tolerated.

This just about covers my discussion of queens. We next come to those above classified as girls with figures. There is not much to say on this point since every engineer probably knows as much as the author. Anything I might have to add would most certainly be censored by the faculty so we now go on into the next and last group.

Those I go with, unfortunately cannot be subdivided. Unfortunately for her also, she cannot go to Rose where men are men and women are —well—women just ain't. The lack of feminine charm at the Institute is cursed by many, but I gain my greatest pleasure watching industrious fellow engineers flush and subdue countless numbers of queens at the crossroads of the nation while standing with my own chained securely to my belt.

GEAR TEETH HARDENED IN 8 SECONDS



IN only a few seconds the oxyacetylene flame adds greatly to the service life of this internal gear. Teeth and other surfaces subject to wear are rapidly hardened by the modern oxyacetylene flame treating process. The depth of hardening is easily and accurately controlled, without affecting the inherent toughness of the core metal.

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Many other applications of the oxyacetylene flame are finding ever widening application in speeding and improving production of ships, tanks, guns, rolling stock and planes. This versatile tool slices through steel with remarkable speed — welds metal into strong, light units — sweeps surface rust from metal structures to extend the life of paint jobs — gouges steel and iron quickly and accurately.

To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

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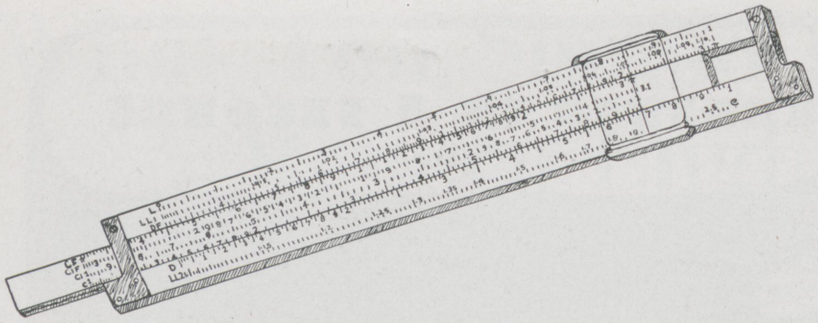


Sly Droolings

Edited by ROBERT K. DRAKE, senior, e.e.

Do you remember the sailor who, when asked what he'd done with his wages, answered: "Part went for liquor, part for women, and the rest I spent foolishly."

A certain soldier in the States received a ten-day furlough, so he could get married and go on his honeymoon. On the eve of the tenth day he wired his commanding officer:

"It is wonderful here. Request ten days extension of leave." The commanding officer replied: "It's wonderful anywhere. Extension refused. Return at once."

Engineers are often baffled by the fact that some of the girls with streamlined figures offer the most resistance.

A newly married couple on a honeymoon put up at a skyscraper hotel. The bridegroom felt indisposed and the bride said she would slip out and do a little shopping. In due time she returned and tripped blithely up to her room a little awed by the number of doors that looked alike. But she was sure of her own and tapped gently on the panel.

"I'm back, honey! Let me in!" she whispered. No answer.

"Honey, honey! It's Mabel. Let me in!"

There was silence for several seconds. Then a man's voice, cold and full of dignity, came from the other side of the doom.

"Madam, this is not a beehive, it's a bathroom."

According to all accounts, including the German, hell hath no fury like that of the Russian who has been already annihilated.

"I know a place where the women hardly wear anything except maybe a string of pearls once in a while."

"My gosh! Where?"

"Around their necks."

Many a girl thinks she shows distinction in her clothes, when the proper word is "distinctly."

Demure Young Coed: "I swear that men's lips have never touched mine."

Sorority Senior: "That's enough to make any girl swear."

Girl Friend (pouring an engineer a drink): "Say when."

Engineer: "Any time after the first drink is O.K. by me."

The minister read the text: "The light of the wicked shall be put out."

Instantly the church was in darkness: "In view of the startling fulfillment of this prophecy, we will spend a few minutes in silent prayer for the electric light company."

When the flood was over and Noah had freed all the animals, he returned to the ark to make sure all had left. He found two snakes in the corner, crying.

"What's the matter," Noah asked.

The snakes weepingly replied: "You told us to go forth and multiply upon the earth, and we are both adders."

"So your brother's a painter, eh?"

"Yep."

"Paints houses, I presume."

"Nope, paints men and women."

"Ooh,—an artist!"

"Nope, just paints Women on one door and Men on the other."

First Lieutenant: "Where've you been?"

Second Lieutenant: "Over in the phone booth talking to my girl, but some punk came along and wanted to use the phone—and we had to get out."

He paced the hospital corridor nervously. Cold sweat stood out on his brow. If they would only hurry! God — every minute seemed an eternity. Would they never let him know? This couldn't happen to him. She meant his whole life, his everything, his—all.

The door opened! A nurse approached him timidly. Her lips parted. He held his breath as she spoke: "Yeh, I can get off tonight!"

Half of these jokes I've seen before, and the other half I don't see yet.—The Editor.

Letter from a college student. Dear Dad: Gue$$ what I need mo$t of all? That'$ right. $end it along. Be$t wihe. Your $on.

Letter from Dad to Son: Dear Son: NOthing ever happens here. We kNOw you like your school. Write us aNOther letter aNOn. NOw we have to say goodbye.

An inventor has produced phosphorescent diaper tabs, to be used instead of pins, for quick change during blackouts.

Usher: "Did you want a front seat, madam?"

French Cutie: "Oui, oui, Monsieur, oui, oui."

Usher: "Pardon me—second floor, first door to your left."

G-E Campus News

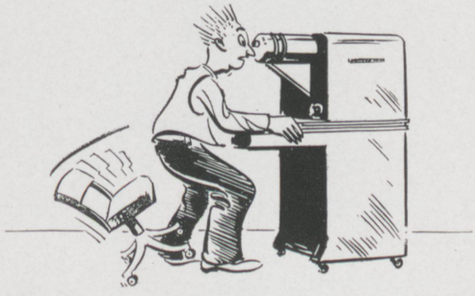
MERRY-GO-WHEEL

A DEVICE that rotates in the manner of a combination merry-go-round and Ferris wheel has been developed to speed the drilling of marine gear casings at one of General Electric's major plants.

Known as a universal indexing trunnion fixture, the device permits quick moving of the casings for drilling at any angle in a full circle and on any plane. Movement is controlled by a push-button.

About 110 holes must be drilled and tapped in each of the casings. Formerly it took a crane to move the casings (which vary in weight from 1000 to 2000 lb) after each surface was drilled, and every piece of work had to be set up at least six times.

Now work is set up just once—on a table that can be turned completely around in either direction with no more effort than it takes to push a revolving door—and 24 to 32 hours a week are saved.



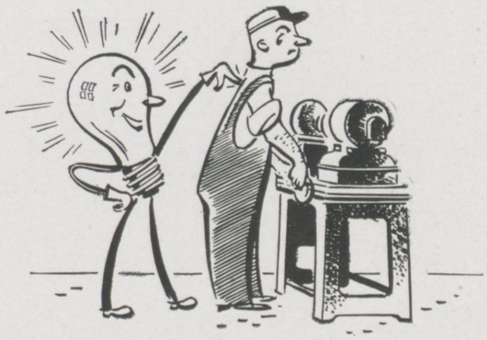
THE BETTER TO SEE WITH

PARTICLES as small as one millionth of an inch—one thousandth of the diameter of a human hair—can be clearly seen with the new G-E electron microscope.

Developed by Drs. C. H. Bachman (Iowa State, '32) and Simon Ramo (U. of Utah, '33), the new instrument can magnify a specimen as much as 10,000 times and reveal the actual composition and structure of such minute things as dust and smoke particles.

Here's how it works: a beam of electrons inside a vacuum chamber passes through the specimen, passes through an "electron lens," and produces a magnified picture on a fluorescent view screen. This image can then be photographed outside the tube and enlarged up to 100,000 times the size of the original specimen.

The microscope, designed for use in small laboratories and war plants, is portable and operates on ordinary house current.



THE LIGHT FANTASTIC

ACTUALLY it's just an ordinary light bulb, but used in an indicating method developed by a G-E foreman, it helps minimize errors in precision lathe work requiring an accuracy of five one hundred thousandths of an inch.

This new method eliminates the human element inherent in the old practice of using a magnifying glass to see when the tool makes contact with the surface to be cut.

In this indicating method, electrical contact between tool and work is used to close a light circuit. The tool is brought up to the surface to be cut in the regular manner until it is just about to make contact. From this point on it is brought up very slowly until the pilot light flickers.

When the light is steady, the indicator is set at zero; and if it is set and read correctly, there can be no error.

If you'd like to try this on your own machine-shop equipment, write for a free diagram and description to Campus News, General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

953-54-211